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BRAIN WAVES • UNDERGROUND FIRES • HISTORIC INVENTIONS

The Magic of Mind

THE STRANGE POWERS of mind were known to the ancients. From every land they trekked to the caves of the oracle. In her presence they were imbued with the mysterious faculty of foresight. She brushed from their mental vision, fear and misgivings. Deep within their consciousness she implanted illuminating ideas with which they went forth to accomplish the seeming miracles history records. Were these geniuses of the ancient world, Pericles, Socrates, Alexander the Great, merely deluded, cast under a fantastic spell, or *can the human mind truly assert an influence over things and conditions?* Is there a wealth of infinite knowledge just beyond the border of our daily thoughts which can be aroused and commanded at will?

It is time you realized that the rites, rituals and practices of the ancients were not superstitions, but subterfuges to conceal the marvelous workings of natural law from those who would have misused them. Telepathy, projection of thought, the materializing of ideas into helpful realities, are no longer thought by intelligent persons to be impossible practices, but instead, *demonstrable sciences,* by which a greater life of happiness may be had.

Dr. J. B. Rhine, foremost psychologist and university instructor, says of his experiments with thought transference and the powers of mind—"The successes were much too numerous to be merely lucky hits and one can see no way for guessing to have accounted for the results." *Have you* that open-minded attitude of today which warrants a clear, positive revelation of the facts of mind which intolerance and bigotry have suppressed for years? *Advance with the times;* learn the truth about your inherited powers.

Let this free book explain

The Rosicrucians (NOT a religious organization) have been leaders in introducing the ancient wisdom of mental phenomena. Established throughout the world for centuries, they have for ages expounded these truths to those thinking men and women who sought to make the utmost of their natural faculties. Use the coupon below—avail yourself of a pleasing book of interesting information which explains how you may acquire this most *unusual* and *helpful knowledge.*

The ROSICRUCIANS
(AMORC)

USE THIS COUPON

Scribe R.L.O.
The Rosicrucians, AMORC,
San Jose, California.

I am sincerely interested in knowing more about this unseen, vital power which can be used in acquiring the fullness and happiness of life. Please send me, without cost, the book, "THE SECRET HERITAGE," which tells me how to receive this information.

Name _____

Address _____ State _____

How to Make YOUR Body Bring You FAME ...Instead of SHAME!

ARE YOU Skinny? Weak? Flabby?

I'll PROVE in 7 DAYS I Can Give YOU a Prize-Winning Body Like Mine

I KNOW what it means to have the kind of body men laugh at and women scorn! Of course, you wouldn't know it to look at me *now*, but I was once a skinny weakling who weighed only 97 lbs.! I was *ashamed* to strip for sports or undress for a swim. I had no *build*, no *strength*, no *pep*. I was only HALF-ALIVE.

Then I discovered the amazing secret that turned me into "The World's Most Perfectly Developed Man." And the same system that worked such wonders for me can make a NEW MAN of YOU! Just as it has put pounds of firm flesh and inches of powerful muscle on thousands of other men, young and old.

JUST GIVE ME 7 DAYS

What's more—I GUARANTEE to show you astonishing *results* that you can *see* and *feel* in your own body within just SEVEN DAYS! In just one week you'll feel bulging new muscle pushing up your chest. Then I get to work filling out your arms, shoulders, legs—strengthening your waist-line—turning you into a real HE-MAN who's ready for lightning-fast sport or hard-hitting fight at the drop of a hat!

In just one week I'll show you what my system of *Dynamic Tension* can do for YOU, right in your own home! It's the quickest, easiest, *surest* way to get a build you'll be *proud* of—a handsome, husky physique with champion muscles that will amaze every man who sees them!

I USE NO "APPARATUS"

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Find out how—FREE! It costs you only a stamp—even a post-card will do—to mail the coupon below. I'll send you at once, without cost, a complete copy of my new, illustrated book, *"Everlasting Health and Strength."* In plain English it tells you exactly what my special *Dynamic Tension* method can do for *your* condition. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique, by my own secret methods. And what I have done for them I am ready to do for *you*. Understand—I *guarantee to prove* that in just *one week!*

THISSTERLING SILVER CUP BEING GIVEN AWAY

This valuable cup stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement in his development within the next three months.

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A free copy of *"Everlasting Health and Strength"* is ready and waiting for you right now. Where shall I send it? Write your name and address carefully on this coupon and mail it *today*. This is your quick way to get the best-built, huskiest, handsomest body of any fellow in your crowd—so don't delay! Rush coupon to me personally. Charles Atlas, Dept. 631, 115 E. 23rd St., New York, N. Y.

Charles Atlas

As he looks today from actual, untouched snapshot. Holder of Title, "The World's Most Perfectly Developed Man."

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Jan. 1938

Mechanics AND HANDICRAFT

Vol. 4 No. 12

NED L. PINES, *Publisher*

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VACU-MATIC SCORES AGAIN!

BOB McKENZIE
TRANSCONTINENTAL AUTOMOBILE CHAMPION
COAST TO COAST

WESTERN UNION TIMED
NEW YORK TO LOS ANGELES 54 HRS. 40 MIN.
LOS ANGELES TO NEW YORK 57 HRS. 26 MIN.
CANADA 15,000 MILES 15 DAYS
LOS ANGELES TO NEW YORK AND RETURN 121 HRS. 52 MIN.
WASHINGTON, D.C. TO MEXICO CITY 52 HRS. 57 MIN.
LOS ANGELES TO PHOENIX 9 HRS. 10 MIN.
MUROC DRYLAKE 1937 AL. 1 DAY
LOS ANGELES TO SAVANNAH, GA. 39 HRS. 27 MIN.
HALIFAX, N.S. TO VANCOUVER, B. C. 100 HRS. 51 MIN.

Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin

Dear Sirs:

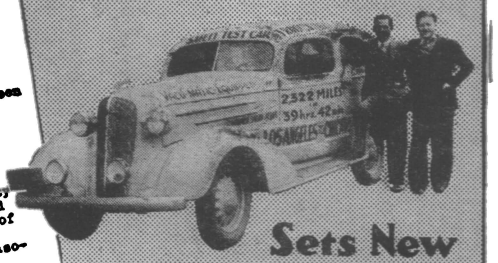
Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gasoline.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 60 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,
Bob McKenzie



Sets New Coast-to-Chicago Record

New Supercharge Principle SAVES GAS

MORE POWER - MORE SPEED
FASTER PICK-UP - - NEW LIFE

ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago — 2,322 miles in 39 hours and 42 minutes— driving 75 and 80 to maintain a speed average of 59.7 miles per hour!

Here is speed—a gruelling grind—where quick accelaration, greater top speed — and less stops for gasoline mean those precious moments saved that make new speed records possible.

The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is positively automatic—simple to install—inexpensive—and pays for itself many times over in gas savings.

Automatic . . Nothing Like It!

Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Easily attached in ten minutes.

The VACU-MATIC Co. Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley —"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove —"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of $15.00 a month, or $180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

— — —FREE OFFER COUPON— — —

THE VACU-MATIC COMPANY
7617 342W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

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Address .....

City ..... State .....

☐ Check here if interested in selling proposition.

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MANY MAKE $30 $50 $75 A WEEK

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Pres., N. R. I.
Established 1914
The man who has directed the home study training of more men for the Radio Industry than any other man in America.

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Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

HERE'S PROOF THAT MY TRAINING PAYS

Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

$10 a Week in Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about $10 a week." — WILLIAM MEYER, 705 Ridge Road, Hobart, Ind.

Head Radio Man with Store

"I am head Radio man of the Sterchi Stores, Inc., Atlanta, Ga., making a salary plus commissions. I am rated one of Atlanta's best technicians, and I owe my success to your Course alone." W. C. CARAWAY, JR., 323 Howard Ave., College Park, Ga.

$200 to $300 a Month in Own Business

"For the last 18 months I have been in business for myself, making between $200 and $300 a month. I have N. R. I. to thank for my start in this field." ARLIE J. FROEHNER, 224 W. Texas Ave., Goose Creek, Texas.

Serviceman for Two Stores

"Along with my own work, I am handling service work for two Radio stores. I receive a salary from one shop and am paid on a piece rate at the other." WILLIAM MOSTELLER, 739 E. 3rd St., Williamsport, Pa.

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their letters in my 64-page book. Mail the coupon.

There's a Real Future in Radio for Well-Trained Men

Radio already gives good jobs to more than 300,000 people. And in 1936, Radio enjoyed one of its most prosperous years. More than $500,000,000 worth of sets, tubes and parts were sold—an increase of more than 60% over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred $30, $50, $75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

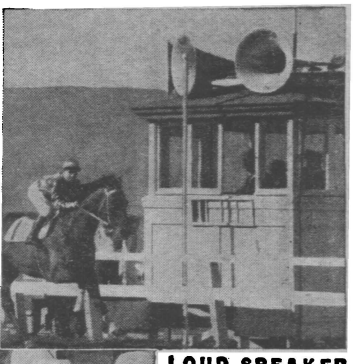
Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your training I send plans and ideas that made good spare time money for hundreds. I send Special Equipment to conduct experiments, build circuits, get practical experience. I GIVE YOU A COMPLETE, MODERN, PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVICING INSTRUMENT TO HELP SERVICE SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

THE TESTED WAY TO

EXPERT

SET SERVICING. Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, 50, $75 a week.



BROADCASTING STATIONS. Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

LOUD SPEAKER SYSTEMS. Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

AUTOMOBILE RADIO. Another new Radio field—selling, installing, servicing. One million or more auto owners will install radio sets within the next year.

I Give You Practical Experience

My Course is not all book training. I send you special Radio Equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

You Get a Money-Back Agreement

I am sure I can train you successfully. I agree in writing to refund every penny you pay if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres., National Radio Institute
Dept. 8AE8
Washington,
D. C.

BETTER PAY

Mail this to get 64 page Book FREE

J. E. SMITH, President, Dept. 8AE8
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____

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In response to numerous inquiries, we present a detailed construction article,

Shoes for Walking on Water

You can stand up on these water shoes, paddle yourself forward, use them to stage thrilling contests —and separately—for other water sports. Build them in your cellar this winter.

* * *

A toy which can be purchased in the five-and-ten-cent stores furnishes the mechanism for producing many interesting effects, some of which are presented in the physics classes in High Schools and Colleges. Look for the article,

Making 10c Physics Apparatus

Mechanics AND HANDICRAFT
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H. C. Lewis

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If you are short of money and need part-time work to help pay for your room and board while training, my Employment Department will help you get a part time job. When you have graduated, they will give you Lifetime Employment Service.

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Here are a few of hundreds of jobs in the Electrical Field. Our Free Employment Bureau gives you Lifetime Employment Service.

DIESEL OPERATOR
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ARMATURE WINDER
SUBSTATION OPERATOR
AUTO ELECTRICIAN
MAINTENANCE OPERATOR

READ WHAT THESE GRADUATES SAY

"Another very interesting part of my work here is the sale and installation of small farm light plants. It is almost worth the day's work to see the pleased and satisfied expression on the face of the farmer when you start the plant and switch on the light for the first time. For many this has been a vague dream which they had never hoped to realize in the rural areas." Harlen Lingerfelt.

"Shortly after I left school, I got a job through the efforts of the Coyne Graduates Service Department. I've been employed for six months now and I've paid back the tuition loan and also have money in the bank. Again I say thank you from the bottom of my heart." Stanley G. Ewasko.

Coyne occupies this entire Modern Fireproof Building.

ELECTRIC REFRIGERATION —AIR CONDITIONING

At this time I am including additional valuable instruction in these two important branches of electricity.

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COYNE ELECTRICAL SCHOOL,
500 S. Paulina Street,
Dept. 18-97, Chicago, Ill.

Dear Mr. Lewis:—Without obligation send me your big free illustrated catalog, with all facts about Coyne Training and details of your "Pay-Tuition-After-Graduation" Plan.

Name.....

Address.....

City.....*State*.....

Mail in envelope or paste on a postcard

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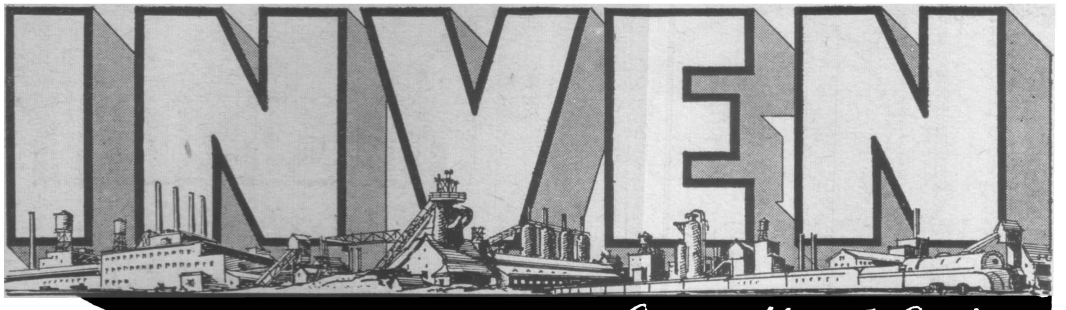
500 S. Paulina St., Dept. 18-97, Chicago, Ill.



Learn How To Get Your

THIS FREE BOOK

FROM THE CRUDE INVENTOR'S SKETCH TO THE

How to Determine The Patentability Of Your Invention

Before you spend money in making a model, or spend weeks in its design, we advise you first to have a preliminary search made through U. S. Patents in the U. S. Patent Office to see if there are inventions like yours already on record; and, if so, let us give you our opinion as to the patentability of what you have.

We employ experienced searchers to perform this service for you. From the reports of our searchers we can quickly form our opinion as to whether your invention is confronted with obstacles in the form of already granted patents.

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We have secured patents for inventors located in every state in the Union. Our organization is a large and efficient one. Our practice is confined entirely to Patents, Trade-Marks, and Copyrights. We have had years of experience in Patent Matters. When you place your invention in our hands, we are in position to proceed at once to secure protection for you. Our fees are reasonable, and if you desire, we can arrange convenient terms of payment.

What Help Is the Patent Attorney?

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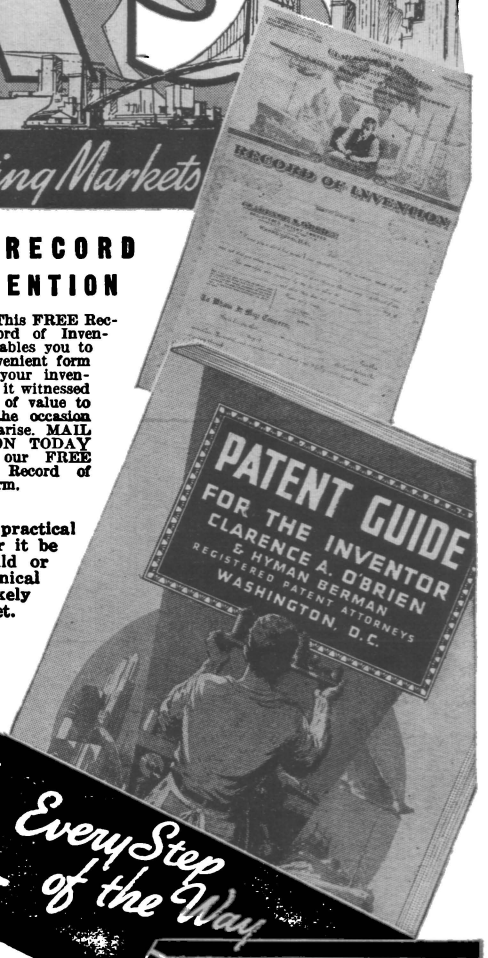

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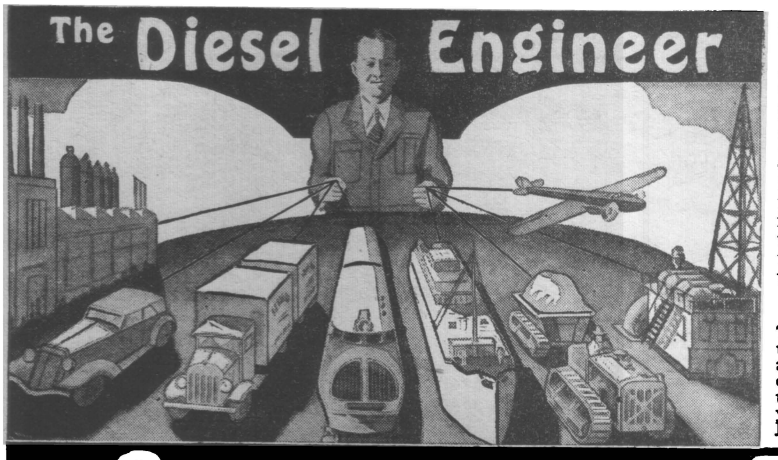

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(Continued on page 16)

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(Continued on page 18)

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Ralph William Rea
Chief Engineer, KOKO
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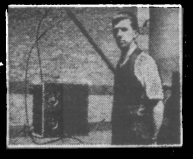
My FNT training and actual experience on your stations KXBY and W9XAL made me the first man selected when WSAY went on the air. We just employed another First National graduate.
Thurlow A. Greene,
Engineer, WSAY,
Rochester, N.Y.

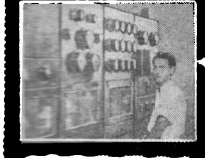


Graduating from FNT I obtained a service shop position without losing a single day. Experience at your Station, KXBY, while training, and my license enabled me to obtain my present position on the WHBF engineering staff.
Nathan W. Aram,
Operator, WHBF,
Rock Island, Ill.

My training at FNT gave me the education necessary to secure my first class license—and a fine position at KGFX. I am happy to know so many of my classmates are making good in a big way.
Robert H. Dye,
Chief Engineer, KGFX,
Pierre, South Dakota.

Several weeks after completing First National training, I took over the duties as Chief Engineer. Thanks to the actual experience secured through FNT's radio and television stations, and the service record on my license, I was hired without question.—J. D. Miller,
Chief Engineer, KBTM,
Jonesboro, Arkansas.

The complete and thorough training I received at First National enabled me to obtain my present position, and handle it most successfully. I am now planning to take advanced work at First National and enter the broadcasting end of radio.
Adrian I. White,
Guenther Electric Shop,
Beaver Dam, Wisc.



I took First National Television training on recommendation of a friend, and it has been everything I expected and more. Your training won me a first class operator's license and a good job at a 5000-watt transmitter here at KFBI.
Harold Davis,
Operator KFBI,
Abilene, Kansas.

Because of the thoroughly [illegible] high-class, modern training combined with [illegible] operation of First National Television I have [illegible] developed a fine business of my own, selling [illegible] radios and accessories. It is having an amazing rapid growth.
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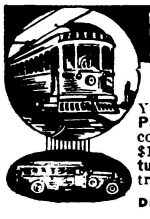

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(Continued from page 16)

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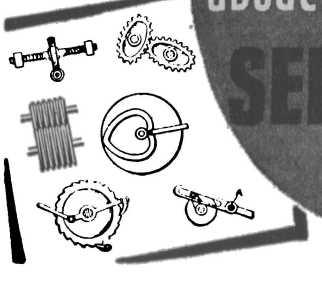

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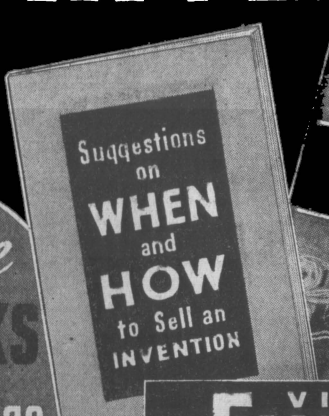

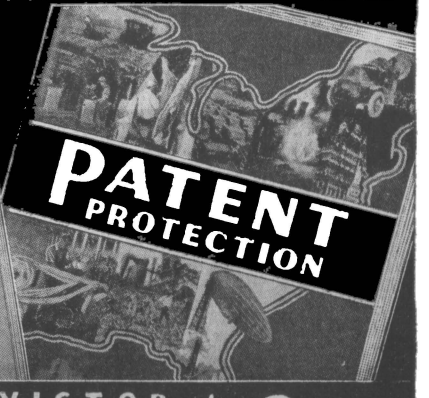

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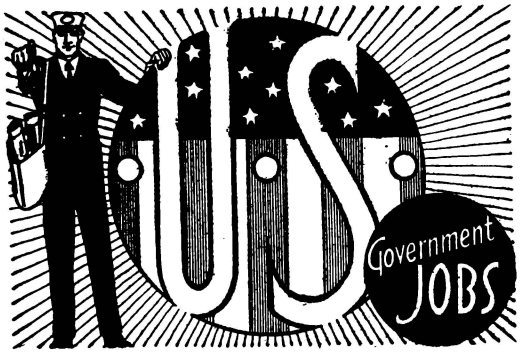

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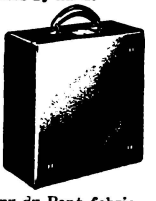

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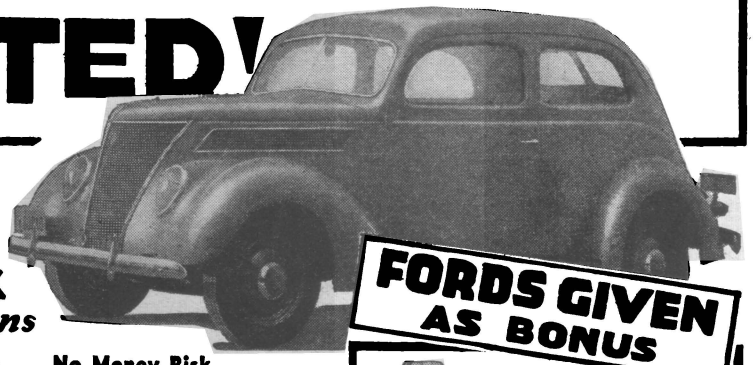

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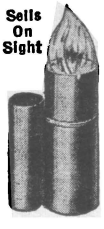

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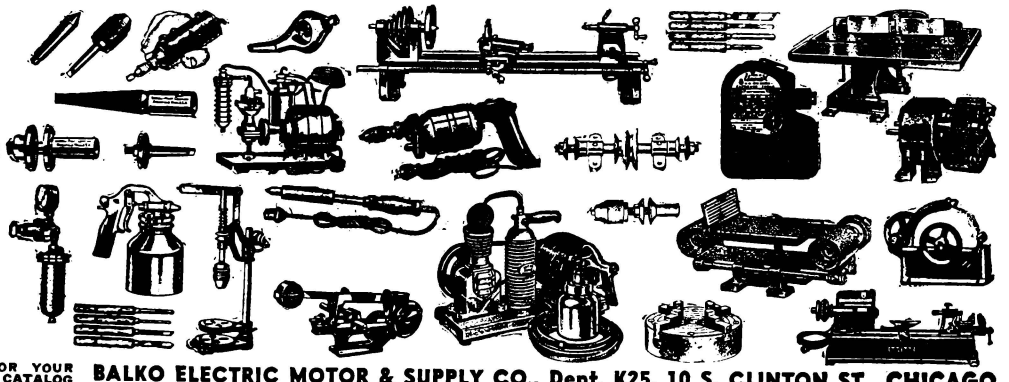

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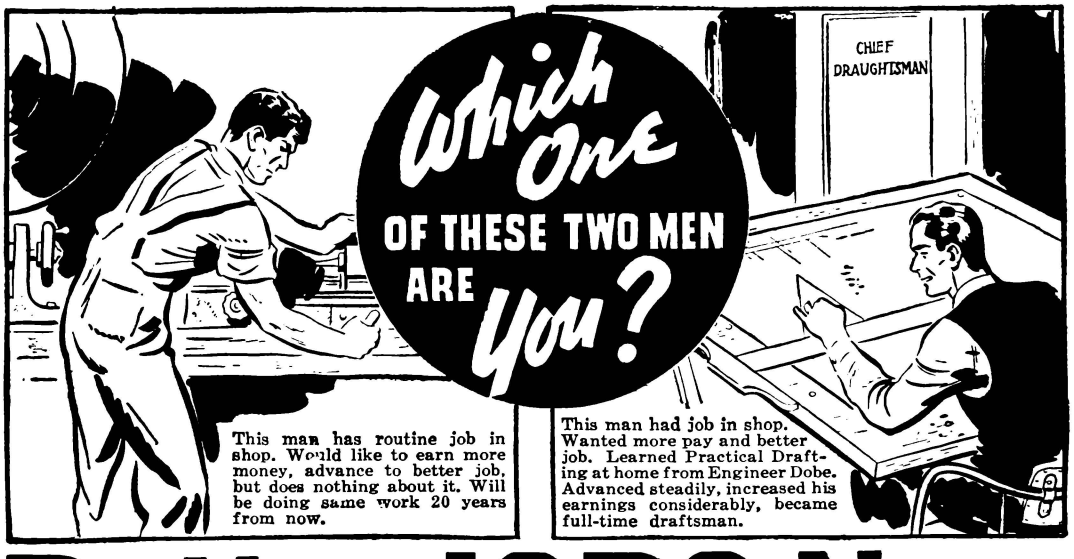
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OF THESE TWO MEN
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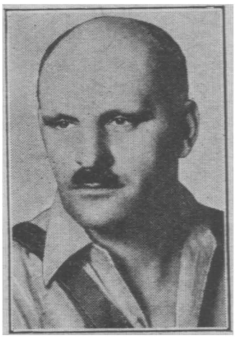
JANUARY, 1938
Volume 4
Number 12

Mechanics AND HANDICRAFT

The Maker of Sleep



The author of this unusual story.

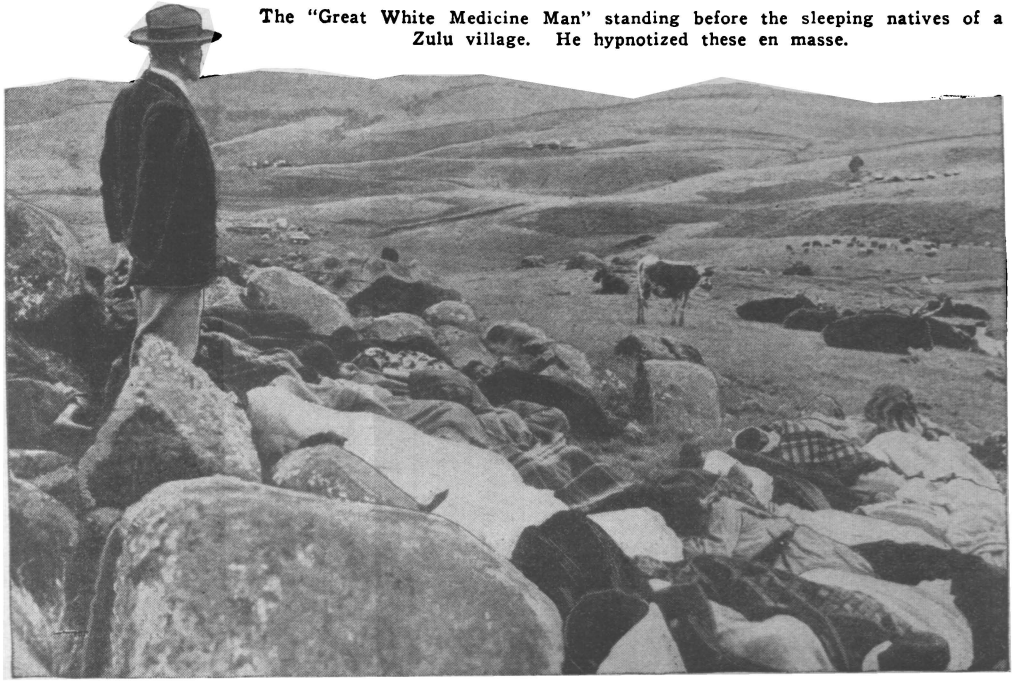
Mysterious Storekeeper Whose Hypnotic Powers Put Natives of a Zululand Village to Sleep En Masse.

By Aleko E. Lilius

Fellow Royal Geographical Society, Royal Society of Arts, Member Explorers Club, New York; Author, Explorer and Journalist.

SOMEONE has said that Africa is a country where either nothing happens or where there is a torrent of events. Either the hot, dry earth is cracking under a blazing sun that kills all growing things or there is a flood that destroys everything within its reach. Africa knows of no compromise. For days one can travel through endless veld without seeing a single wild animal;

The "Great White Medicine Man" standing before the sleeping natives of a Zulu village. He hypnotized these en masse.



A black priest of a Zulu tribe looks powerful astride his horse but he fears for his life if he were to disclose the location of the "White Medicine Man."

then, suddenly, across the next hill there are flocks of game by the hundreds, or perhaps thousands.

For 18 months I had been criss-crossing the mountains of Zululand, finding nothing worth the ink. Then, unexpectedly, events came rushing with a vengeance.

Zululand is a land of witchcraft and black magic. A century of missionary work has not been able to stamp them out. From birth, the Zulus—man, woman and child—are governed by superstition, strange coincidences, good and bad omens, and the word of the almighty doctor. Woe betake anyone who makes an enemy of the ambassador of Africa's dark powers, because he can order his chosen victims to die. And usually they oblige him by *dying,* seemingly from no cause whatever.

The white man's law, in black country, does not yet recognize murder by will-power, or hypnotism, as a crime. To the law, murder is murder only if committed by hand, poison or weapon. When gathering information about these things, one cannot go to the white officials, and the police will tell you nothing. However, on rare occasions one finds laymen and scientists interested in matters of this nature.

Bitter enemies are made to dance until they drop.

Below — The author and guides traveling toward the unknown territory.

Top—Even warriers fall in their war regalia when the "White Medicine Man" commands them to.

Men, women and children, fast asleep in grotesque positions they assume when told to go to sleep.

During my wanderings through Zululand I had the great luck of finding such a man. He is a practicing physician in a small white settlement, Nkandhla. Born in Zululand, he speaks the strange tongue of the natives well, and is trusted by them implicitly. He believes in witchcraft. As a practitioner, he knows the

The "White Medicine Man" peering over his victims. He is a storekeeper in Zululand where he is treated like a god and feared by all.

value of hypnotism to the medical science, and firmly believes that a man can be hypnotised to die, and that the Zulu witch-doctors occasionally use hypnotism for that sinister purpose.

When chief Manyala, near Nkandhla, received the doctor's assurance that I was "all right," he ordered his chief witch-doctor—a woman—to tell me all I wanted to know about witchcraft (white and black magic). However, he made it a condition that my presence in the *kraal* should not be disclosed to other witch-doctors—"as they may not like it."

Through many a day and night we sat and talked of things mysterious and often incredible, but during my many years of wandering through China, Siam, Indo-China, the Philippines, Borneo, the South Sea Islands and now in Africa, I have learned *always* to listen—and often to believe.

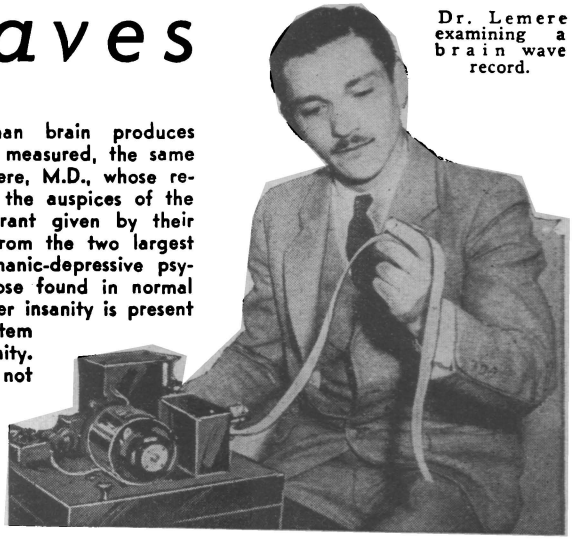
She taught me how to mix love potions (white magic), how to wish locusts on my neighbor's fields (black magic), how to locate stray cattle (white magic), and how to wish death on your enemy (very black magic). I learned how to throw the bones and by their position foretell one's future (black and white magic mixed). She also taught me how to practice astral wanderings. All the time I made innumerable notes. I am certain she herself believed in her own powers. Again and again she warned against the Isanusi* (the witch-

* A male witch-doctor is called Isanusi, a female Isangoma.

(*Continued on page* 69)

Responding to the command to awaken the victims of White Man's spell recover from their commanded sleep.

Brain Waves



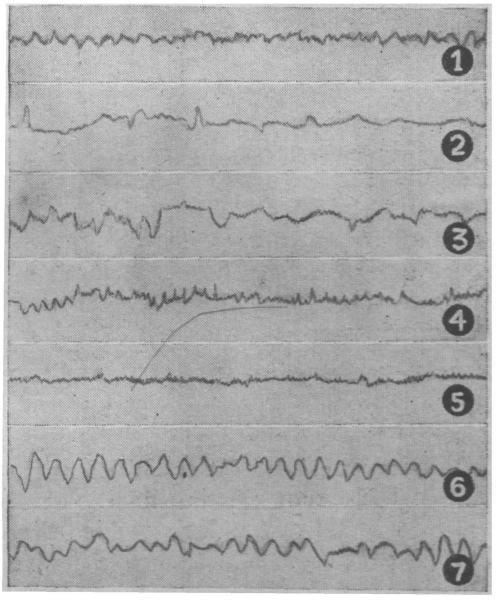
Dr. Lemere examining a brain wave record.

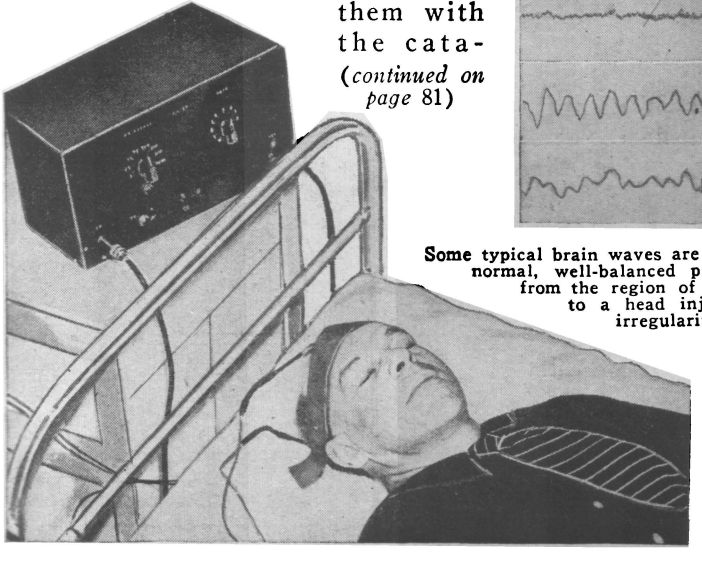
Recent researches indicate that the human brain produces rhythmic waves which may be recorded and measured, the same as heartbeats. According to Frederick Lemere, M.D., whose researches in this field were conducted under the auspices of the American Medical Association through a grant given by their Committee on Scientific Research, records from the two largest groups of insanity, dementia praecox and manic-depressive psychosis, are not absolutely different from those found in normal people. The brain waves cannot show whether insanity is present or not, but do show the type of nervous system which is susceptible to these forms of insanity. Whether the psychosis actually develops or not on this ground work is a matter of psychologic and environmental forces as well as a degree of defect present. In insanity due to syphilis, epilepsy, brain tumors or head injuries, however, the waves are different from those of a normal person. The main value of this work so far has been in research, but it also has limited diagnostic possibilities.

The record comes off in the form of a thin ribbon of tape, the lines having been drawn in ink by the oscillograph.

BRAIN WAVES! What are they, and of what value are they to the medical profession? According to the researches now being carried out in several of our leading physiological laboratories, the human brain radiates rhythmic waves of low frequency which can and have been recorded on a fairly simple apparatus. Medical experts of tomorrow may be able to diagnose our mental conditions by making a study of our brain waves, over a short period of time, and compare them with the cata-

(*continued on page* 81)

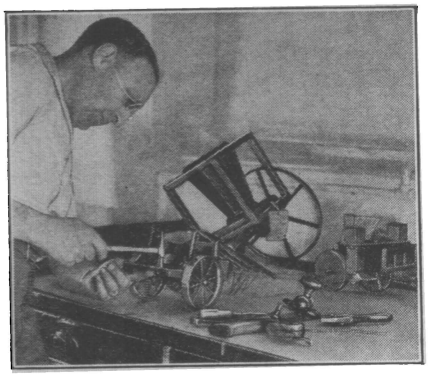


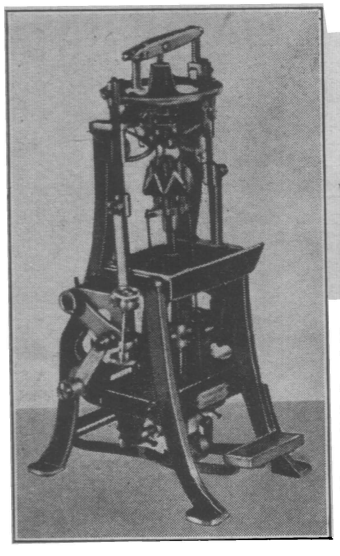


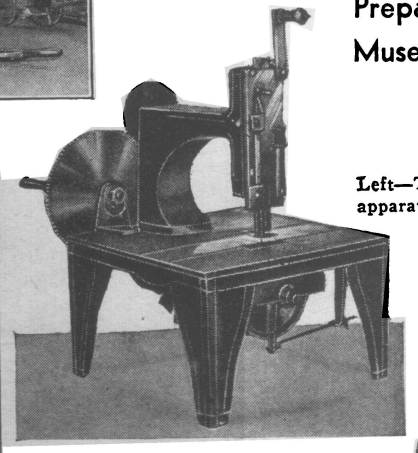
Some typical brain waves are found in the charts above. 1, a normal, well-balanced person; 2, two "spikes" coming from the region of a brain tumor; 3, insanity due to a head injury, note increased length and irregularity of the 5-per-second waves; 4, sharp spiked waves during an attack of epilepsy; 5, dementia praecox (schizophrenia) insanity—There are no 10-per-second alpha waves here; 6, the big 9-per-second waves found in insanity of the manic type; 7, insanity due to syphilis of the brain. Left—Patient during a test with the electrodes applied to head. Note cabinet containing the first stage of amplification.

Historic

More Than 20,000 Early Patent Models Are Catalogued and Prepared for National Museum Exhibit by WPA Workers



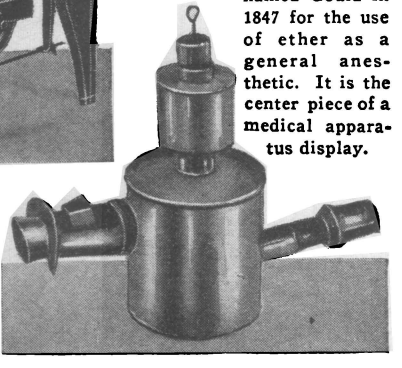




Original patent model of Isaac M. Singer's sewing machine dated 1851.

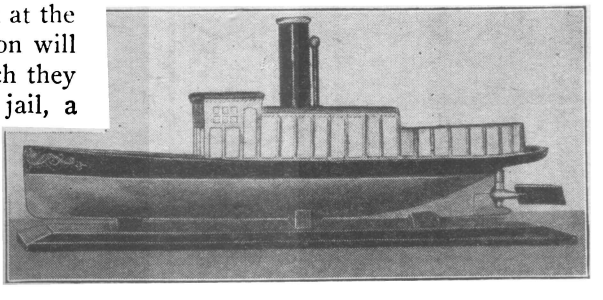
Top—WPA workmen repairing a stalk-puller model. It is difficult to comprehend how this work can be done with the tools illustrated.

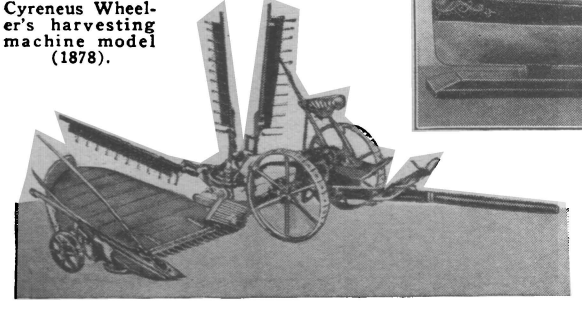
Left—Model of a hat stretching machine patented in 1878.



Left—The original model of the apparatus patented by Dr. William T. G. Morton and a man named Gould in 1847 for the use of ether as a general anesthetic. It is the center piece of a medical apparatus display.

THE cream of the early basic patent models of the United States, together with important models showing the story of their development, is being put in shape for exhibition at the National Museum. Their exhibition will follow a hectic career during which they have been stored in a tunnel, a jail, a warehouse and elsewhere, in the utmost confusion. Their recovery reads almost like a page from fiction. They include working models from that rich period of





Cyreneus Wheeler's harvesting machine model (1878).

In 1867 Samuel Wait submitted this model along with his application for a patent. It was a new type of propeller. This is one of 20,000 original working models which are being restored for display at the National Museum at Washington, D. C.

Inventions

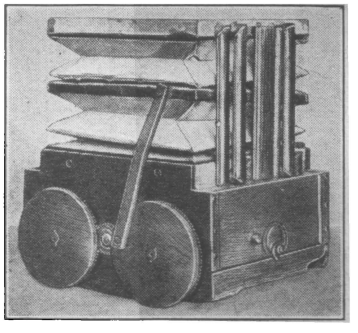
American invention from 1836, when the Patent Office was burned out, to 1890, when the law of 1870 was put into effect whereby a model need only be submitted at the direction of the Commissioner of Patents. Even so, models were found dated as late as 1904.

The story really begins with the Act of Congress of 1926, which authorized dispersal of the 155,000 working models held in storage. The Act authorized the Smithsonian Institution to take for the National Museum such models as it thought would be of interest to posterity. The inventors or their heirs were to have next choice for the hauling away and, after

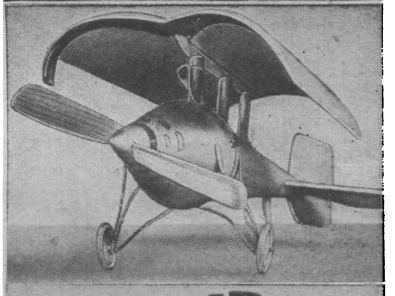
(Continued on page 71)

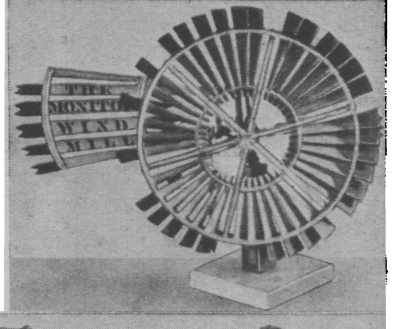
When Ely Whitney patented his cotton gin he made four duplicates of the original model submitted to the Patent Office. Two models were burned in Patent Office fires. One of the remaining models was turned over to the Museum in 1884. It serves as the centerpiece of about 1,000 models relating to textile machinery.

Ignatz Glanschnig applied for a patent on an airplane in 1929. The Commissioner of Patents exercised authority and demanded submission of a working model. This is it.



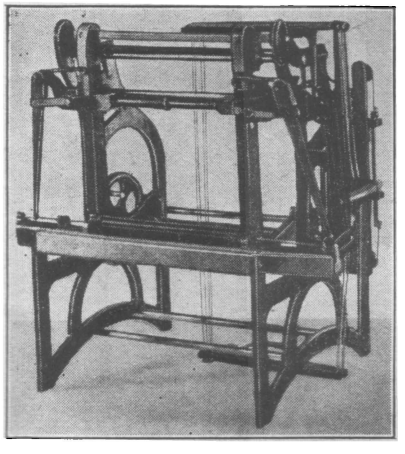
Above — A working model of a carpet sweeper submitted for patent by D. Hess in 1860.

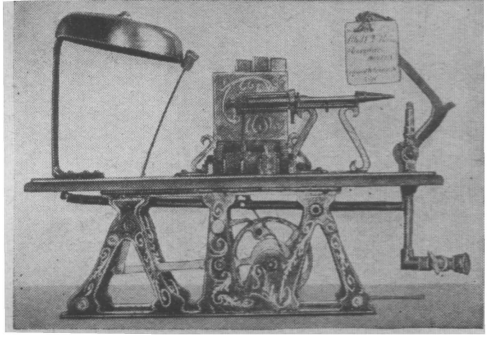




Right—Patented as a wind engine, this is the original working model submitted by L. M. Sparks (1881).

Below—Heirs of William Crompton claimed this original working model for a power loom (patented in 1837), but returned it for display at the National Museum.



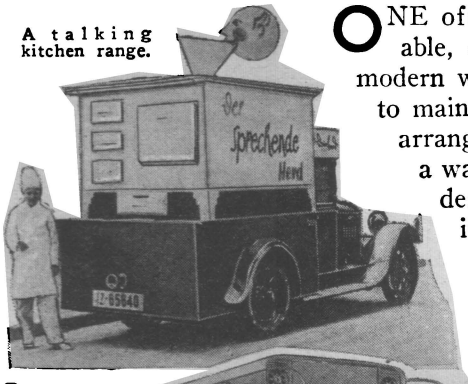


Abbott L. Ross obtained a patent in 1871 on this burglar alarm shown at the right.

"Kanonen Statt

(Cannon Instead of Butter)

Germany, in an effort to become self-sustaining, is making every attempt to substitute other products for the foods to which the populace is accustomed. Intensive propaganda by sound trucks and advertisements is employed to make the new "foods" more tasty.

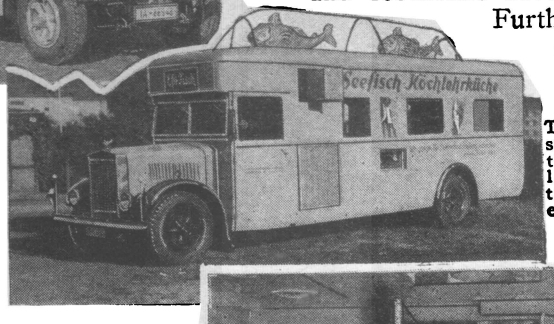


A talking kitchen range.

ONE often wonders whether it is necessary, advisable, or even desirable, for any country in this modern world to become self-sustaining, and to fight to maintain that status. The advantage of such an arrangement is apparent if the country anticipates a war; whether that war be one of aggression or defense is of little note. Unless self-sustaining, it becomes apparent that the country would need an extensive naval force and battleships (or iron-clad contracts) to guarantee delivery of the food the people will need and of which they would be deprived, if seaports were blockaded.

Today the shortage of raw material has advanced to almost a state of acute crisis in Germany. Because of the Reich's monetary isolation, attempts to import raw materials and foodstuffs have failed. Furthermore, many of

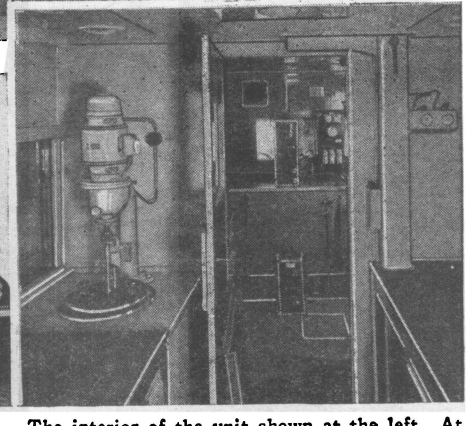
By means of a powerful public address system this mobile kitchen range is used to educate housewives in the preparation of food substitutes.



This truck suggests to the populace that they should eat more fish.

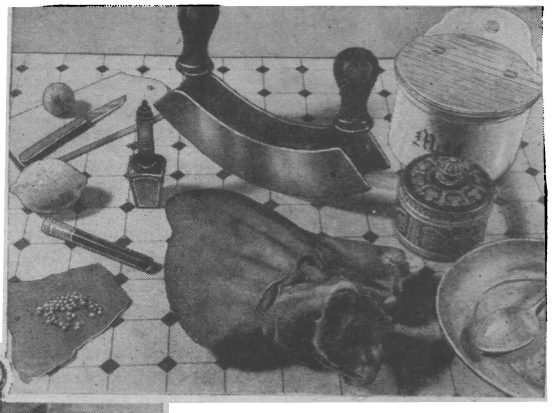
The margarine department of Germany's famous mobile kitchen caravan is completely equipped to advance the sale of margarine instead of butter. This propaganda for German foodstuffs is of great value in making Germany self-sustaining and in maintaining the foreign exchange.

A typical "strength through joy" propaganda truck which aims to educate Germany's populace in the use of "wholesome foods"—really food substitutes.



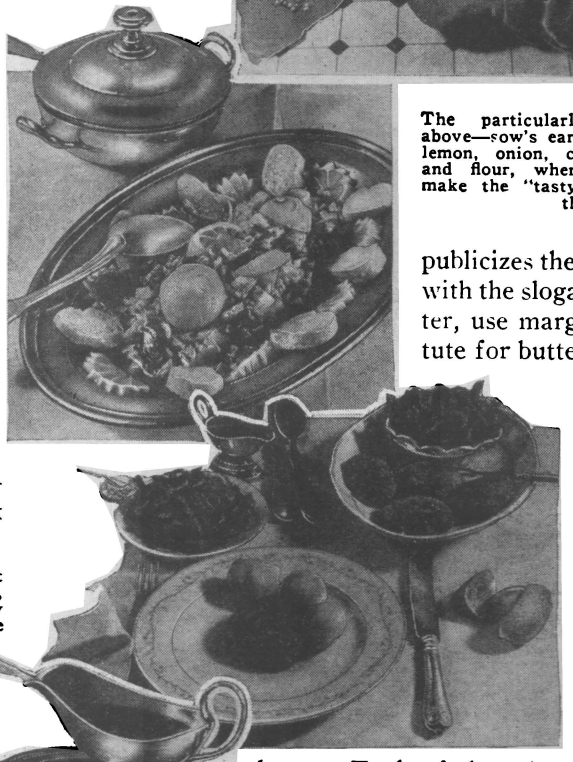
The interior of the unit shown at the left. At the forward end is the electric kitchen; in the rear, the P. A. system.

Butter!"

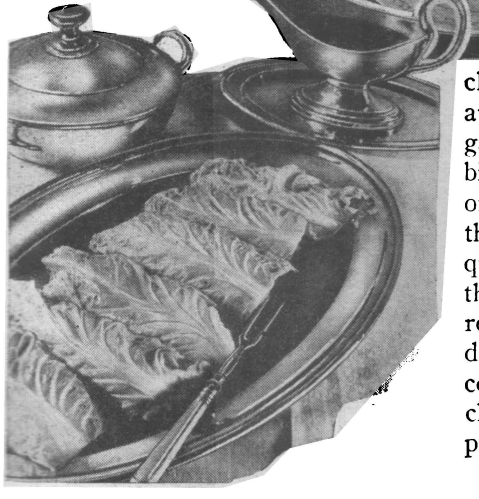


The particularly inviting victuals above—sow's ear, salt, pepper, capers, lemon, onion, condensed soup cubes and flour, when correctly prepared, make the "tasty" dish illustrated at the left.

the raw materials which are needed for human consumption are used in building up a vast war machine. Still, the populace must eat, so the Nazis are eulogizing "new foods" suitable for "the present German tastes." Sound trucks convey to the German people an entire educational series of lectures. There is a talking kitchen range which instructs the housewife in the use of German substitutes for those foodstuffs which were heretofore imported and which today are virtually unattainable. Another truck publicizes the use of margarine with the slogan, "don't use butter, use margarine" (a substitute for butter made from fats and oils either with or without a percentage of butter). A third truck tries to stir up a demand for sea foods, which can be obtained by Germany's fishing fleet and do not require foreign exchange. Each of these beautiful educational automobiles (many of which convey the slogan, "strength through joy") contains a mobile kitchen unit, a public amplifier and one or more educators, who show how to prepare the domestic foodstuffs and answer any questions which might be asked. As part of this same propaganda, new German cooking recipes show how to prepare "tempting" dishes from, for example, the following concoction. A fresh or smoked pig's ear is chopped, then a thick gravy of flour, salt, pepper, lemon juice and condensed soup



The "hamburgers" at the right, ready to eat, were made principally from cow's udder. The cabbages below are stuffed with oats.



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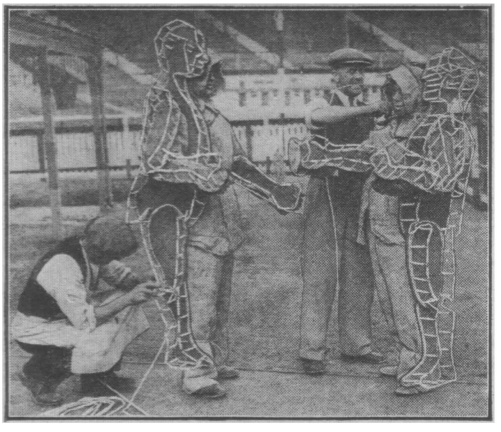


Boxing Fireworks

SOMETHING new, indeed, is the boxing bout presented at White City to take the place of the fireworks display program formerly presented at the old Crystal Palace, London, England.

Two men clad in cumbersome asbestos suits have jointed wooden frames attached to these suits and upon the wooden frames are fastened tubes of colored fire. Thus, at night, when this display is set off, the spectators only see a "fireworks" outline of the boxers going through their rapid paces.

Safety Vests for Traffic Officers

A VEST, studded with reflectors, is one of the latest innovations on the behalf of safety. Just as the reflectors along the highways indicate "Sharp Curves," "Hill" and "Slow Down," so this vest becomes illuminated when the lights of an approaching car strike it, enabling the driver better to see the officer.

This safety vest is at present being used by the police force of Bridgeport, Connecticut, and the officer above is a member of that force.

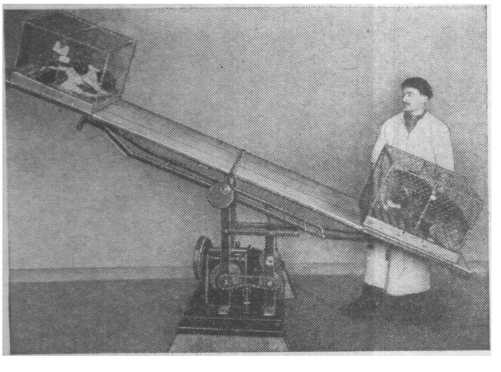
Pocket Portable Typewriter

THE photograph above shows what is purported to be the smallest typewriter in the world.

A comparison of sizes can easily be made by observing the ordinary match box next to the typewriter. It was introduced at the Business Efficiency Exhibition at Earl's Court (England) recently.

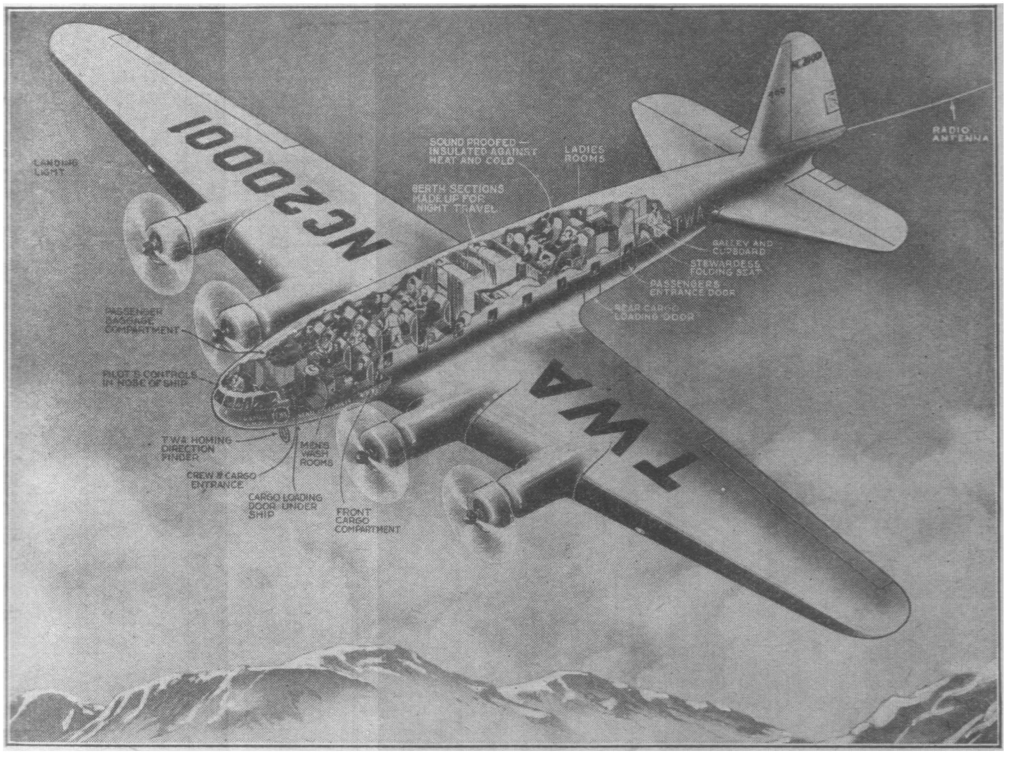
Dogs See-sawed to Find Cure for Seasickness

DOCTOR POZERSKI, famous veterinarian and head of the new Paris dog pound, has invented a novel device for studying the cause of seasickness in animals. An electrically driven see-saw, with cages at either end, reproduces the motions of a rocking boat. From a study of the dog's reactions, he hopes to find a cure for their shipboard distress and—eventually—to prevent the same illness of their masters.



The photograph shows the see-saw with two dogs all set for a "sail on rough waters."

New Giant of the Air



THE fast-growing passenger traffic on our airways now makes profitable the operation of giant airliners, and the limit is not yet in sight. Work has just been started at Boeing Airplane Company, Seattle, Washington, for a fleet of 32-passenger four-engined aerial mammoths, to be placed in service by Transcontinental and Western Air in the Spring of 1938. Six such ships are now under construction, and the air line has an option on 17 more.

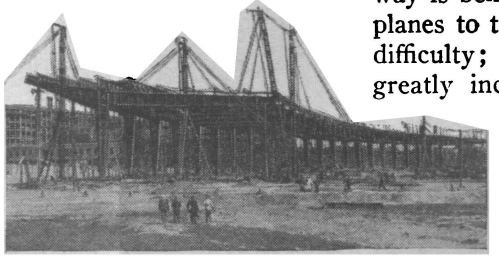
Larger than the famous Boeing "flying

(*Continued on page* 81)

Concrete Hill for Airplane Take-Offs

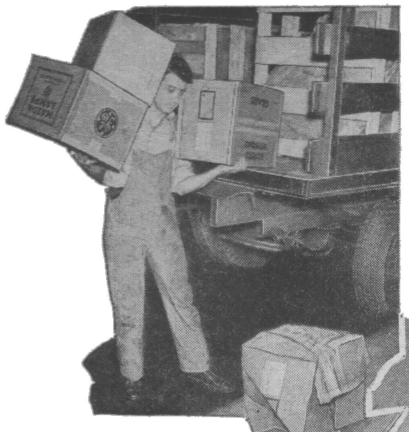
THERE is always a problem of getting heavily loaded airships off the ground, and many and varied are the methods promulgated for this purpose.

At the Tempelhof Airport in Germany, a super-runway is being built to enable the planes to take the air with less difficulty; this, in addition, greatly increases the facilities of the field because the space under the runways will be used for hangars, restaurants, waiting rooms, garages and airport activities.



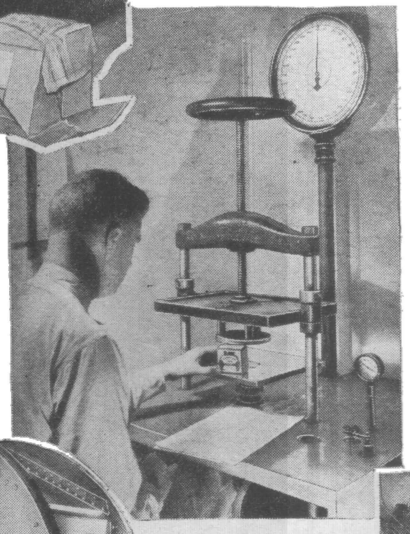
Runway of the Templehof Airfield in Germany, under the processes of construction. This runway starts at ground level and gradually sweeps upward in a long curve.

Smashing Cartons in the *Laboratory*

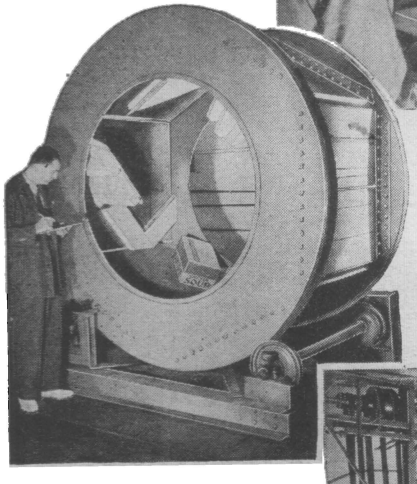


Rough handling; but such an accident could occur at any time. To preserve the contents of a carton so manhandled is the aim of an unusual testing laboratory.

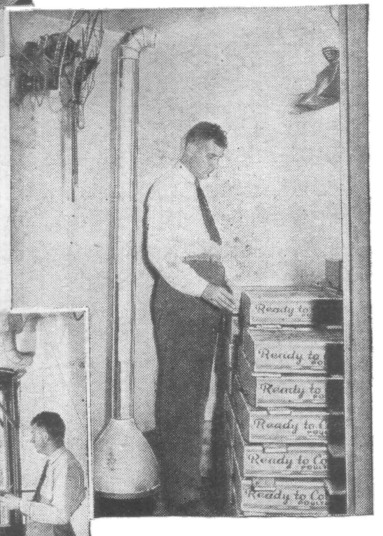
SEEING just how much destruction can be done to cardboard cartons is a duty of one of the strangest testing laboratories of its kind in the world. All sorts of mechanical devices are employed to press, pound, or tear cardboard boxes and their bindings; but all of this work is done with careful measuring instruments. For example, a small compression machine, utilizing air pressure, raises a table and crushes the sample being tested. The amount of resistance offered by the corrugated box is a measurement of its rigidity. When compared with boxes of different shapes the ideal container is evolved. Another mechanism is a revolving drum with baffles arranged to toss the container around.

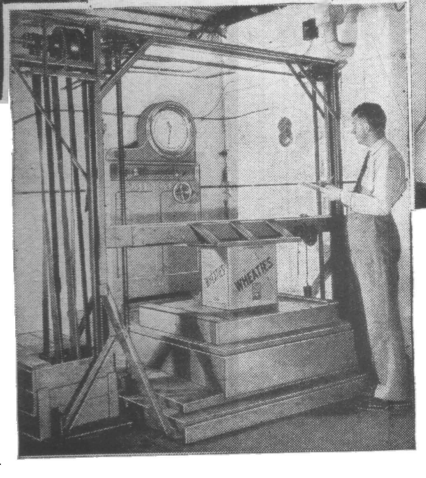


A small carton containing a bottle of ink is being crushed to determine its resistance.



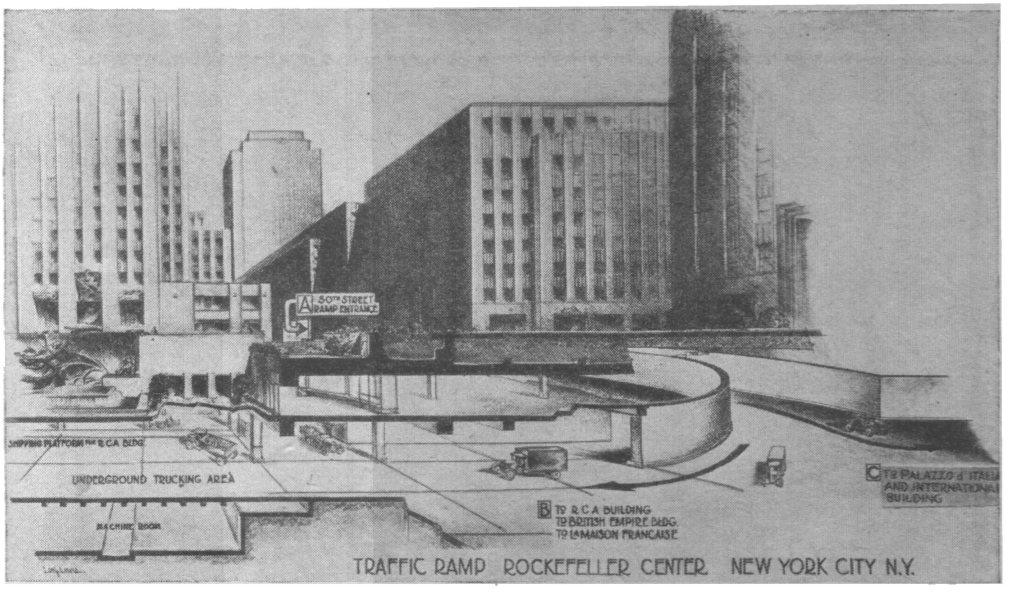
Left — Loaded cartons are buffeted around in this drum at a rate of two revolutions per minute.





Above—It is quite damp in this room. Vaporized water in the form of a fine mist leaves the pipes and circulates around the boxes in the room. 85% to 100% moisture is maintained.

This large compression machine measures the crushing resistance of an empty container.


A 50TH STREET RAMP ENTRANCE
UNDERGROUND TRUCKING AREA
B TO R.C.A. BUILDING
TO BRITISH EMPIRE BLDG.
TO LA MAISON FRANCAISE
C TO PALAZZO d' ITALIA AND INTERNATIONAL BUILDING
TRAFFIC RAMP ROCKEFELLER CENTER NEW YORK CITY N.Y.

"A" shows entrance to traffic ramp; Entrance to the actual trucking area is made at "B" and "C", 34 feet below the street level.

Gopher Burrows for Trucks

THE ever-increasing number of vehicles on the busy streets of New York City and the difficulty of finding parking space required for delivery of merchandise to the various office buildings has led to the first underground traffic ramp; this 450-foot steel roadway, 34 feet beneath street level, is located in Rockefeller Center. The entrance is on the north side of 50th Street, at sidewalk level, midway between 5th and 6th Avenues, from which point the road leads to the trucking area. Grades of 7 per cent at the curves and 9 per cent on the

(*Continued on page 92*)

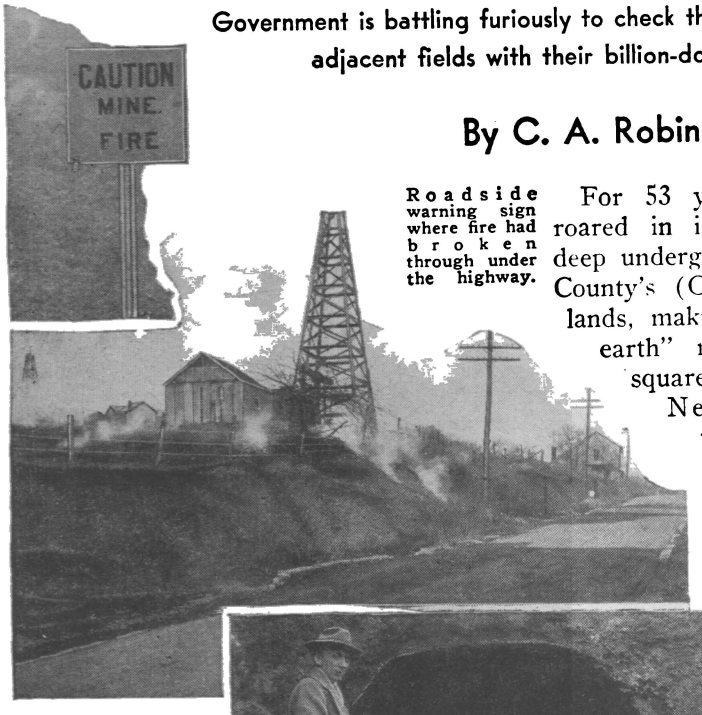
General view of the huge shipping and unloading room in Radio City.

Above — The exterior of the ramp which diverts trucking from street level to the huge shipping and unloading room 34 feet underground. Right — The receiving station at the bottom of the ramp.

Underground Fires

$50,000,000 worth of high grade coal has already been consumed by underground fires which have been burning for fifty-three years. The Government is battling furiously to check the fire before it spreads to adjacent fields with their billion-dollar unmined fuel.

By C. A. Robinson



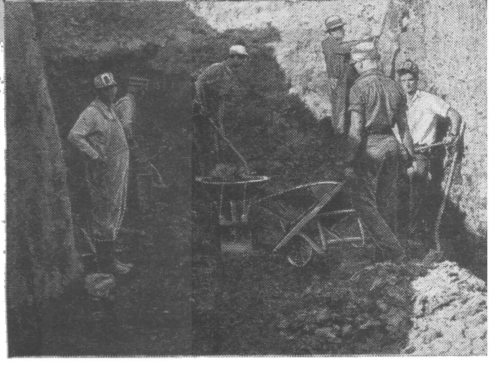
Roadside warning sign where fire had broken through under the highway.

For 53 years it has raged and roared in its ever-growing caverns deep underground in southern Perry County's (Ohio) once valuable coal lands, making a veritable "hell on earth" more than seven miles square between Shawnee and New Straitsville, some twelve miles south of Perry County's seat of New Lexington.

This roaring fire dragon,

The black spots in the highway show where the cave-in was filled; the underground coal fire had burned under the road along the vein, all around an oil producing well (covered with three layers of casing to keep the oil from firing) and is now near the $80,000 High School at New Straitsville.

Men were working in this mine at the left twenty-four hours before this photograph was taken. They felt the sides of the mine getting hot and fled a few minutes before the blaze broke through.



WPA workers making a huge tunnel on Plummer Hill. The coal will be taken out of the veins and the area filled with mud to stop the blaze.

ARMED with all the latest accoutrements of science, Uncle Sam, like the legendary St. George, sallies forth to slay a terrifying flame-belching dragon. But, unlike the fabled monster allegedly slain by England's patron saint, this dragon is a real enough personification of one of nature's most ruthless forces.

A mine rescue squad in training. Drills of this nature are imperative and frequent.

burning continuously and furiously since 1884, has eaten more than $50,000,000 worth of high grade coal and now threatens the great Hocking Coal Fields with their billion-dollar treasure of unmined fuel.

Turning fireman in a big way, Uncle Sam is using steam and electric shovels, dynamite and the hard swinging picks of WPA workers to tame the "inferno," as Perry County Miners often call this subterranean conflagration that has been making a charred desolate waste of the landscape, filling the air for miles with fumes, smoke and soot and defying all previous efforts to subdue it. The state has joined the Federal Government in this ambitious $365,000 battle to check the ravages of this destroyer and choke off what is declared to be the world's greatest and costliest fire of its kind.

The Lanning mine near New Straitsville. The owners were just opening the mine and thought they had forty acres of "free" coal. On returning the following morning the entry was on fire and flames were shooting into the air to a height of 25 feet.

Thirty-five acres of coal land on fire. The hill is dotted with great holes emitting heat, flames, gases and vapor.

Left—Dave Rush found this in his garden last fall. The spot was just five hundred feet east of his home.

Only now, after weeks of strenuous labor by some 300

Two miners warming their hands by a small blaze. They do not dare approach the great mass of smoke just ahead of them. Here the heat caused the earth to separate and the hill split, allowing the flames to come to the surface.

Compare this photograph taken six months later, with the one on the previous page. At this time the fire was advancing at a rate of 100 feet a week in Dave Rush's garden.

Coming home from work one day, this was the view from Dave Rush's porch. A large crack opened up near the front window of this house, then miraculously closed again.

men and many powerful machines, it is announced that the tide of the battle is turning; but the fight is not yet won. The strategy of the battle is to isolate the blaze and its immediate fuel and let it burn itself out. Like the pioneers who plowed furrows in the path of prairie fire, the coal fire battlers are digging up the veins of coal which the mine flames would follow in their natural course.

Plans of government engineers call for the erection of three barriers to hem the fire demon in effectually. By thus confining the conflagration to this relatively small area, the engineers believe it will be possible to save the rest of the extensive Hocking Valley deposits, which produce a tenth of the nation's

coal supply. Two types of barriers are being built; where the coal is reasonably close to the surface, the program calls for digging it out with steam shovels in the usual strip-mining fashion. After the soil is removed, the coal is to be taken out in a deep, wide "cut," which is then filled with wet mud.

The other type of barrier is a tunnel driven straight through the coal seam. All the coal in the tunnel's path is taken out, of course, to prevent any possibility of the fire jumping across the tunnel. Plans call for the sinking of holes to it from the surface, then a stream of mud is to be pumped down through the holes to fill the tunnel.

James Berry, superintendent of the Ohio Bureau of Mines, has asserted that, when entirely isolated, the fire may take 1,000 years to burn itself out in this "inferno's" cancerous region.

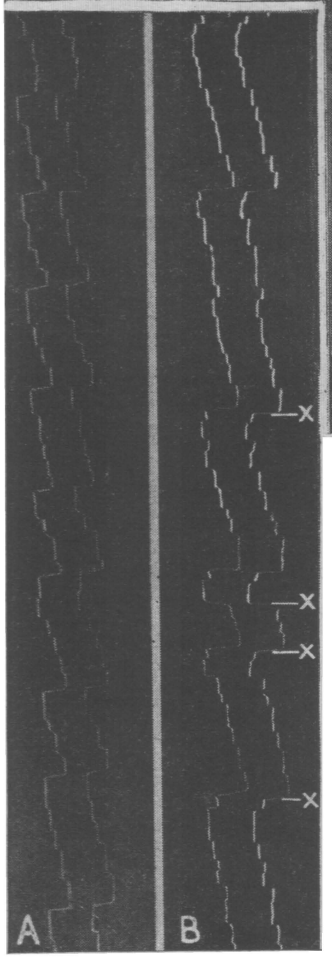
Berry, who assisted engineers of the

(*Continued on page 78*)

A huge ditch being dug by steam shovel and the coal being taken out so that the fire cannot cross over. Note photograph at right.

A house stood on this spot. The terra cotta casing from which smoke is issuing was once a cistern. From this the farmer obtained his water. Suddenly the cistern went dry, then smoke and heat began to belch forth from the hole in the ground. The house was torn down.

Determining the reading speed of a student with a new eye-recording machine at the first "reading institute" at New York University.



Two ophthalm-o-graph records; A shows fixations which are too long in duration; B shows difficulty in eye coordination as indicated at X and illustrates convergence of the eyes by "spreading" of the record.

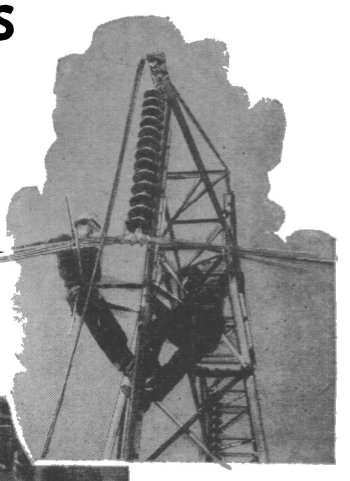
Camera for the Eyes

WHEN a person reads a printed page, his eyes move horizontally across the page from left to right, but in this movement there are frequent pauses —sometimes backward movements. The first are termed as "spans of recognition," the second are due to inaccuracies of perception. A new instrument to record these eye motions has been developed. Small lights are focused on the eyes and reflected by the corneas. These reflections produce a line on a film moving through the camera at a constant rate of speed. A peculiar stairway pattern is recorded when a person is reading. From the graph a teacher can locate those pupils who have acquired an effective reading habit; those who need development and those who can be advanced.

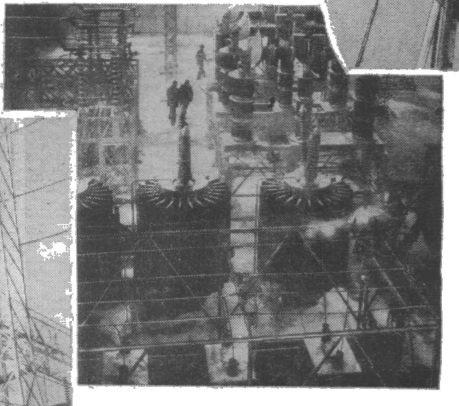
Science Advances —in the Movies!

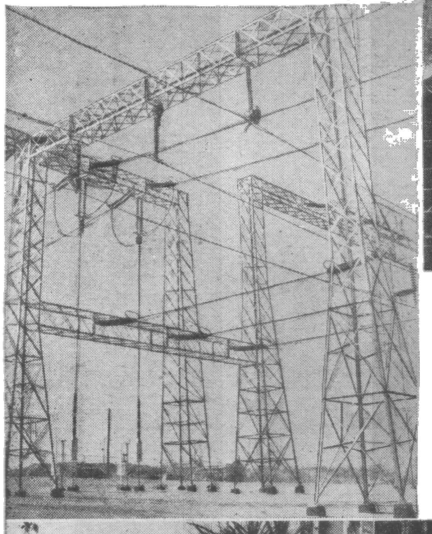
USUALLY, those responsible for "scientific" settings in motion picture plays find it necessary to assemble all sorts of inconsequential apparatus and couple it together in a stupid, haphazard fashion to illustrate a result which the equipment could not give. Any reader of this publication will admit that a meaningless array of flasks, test tubes, sparks and flames is less striking, from the standpoint of analyzing a metal, for example, than is a projection of the spectrum on the wall of the laboratory. This is particularly true if the scene were introduced in color. And every reader of this

(*Continued on page* 86)



Henry Fonda, famous movie star, is here shown perched near the top of a power-transmission tower.





Both the tower and the interior of the electrical transmission plant lend a mark of realism rarely obtained in scientific sequences in the movies.

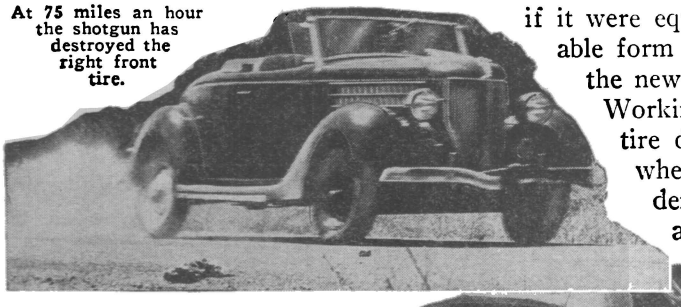
A complete transmission tower was built on the lot for a recent movie. This photo shows the finished product.

There are only four girls in this photograph, which was taken by an arrangement of mirrors. The method is explained in the text.

The dressmaker and dancer are seen mirrored in a long line. Photo taken at the Highbury Studios in London, England.

Front Tire Blow-Outs Are Not Hazardous

By F. Leland Elam



At 75 miles an hour the shotgun has destroyed the right front tire.

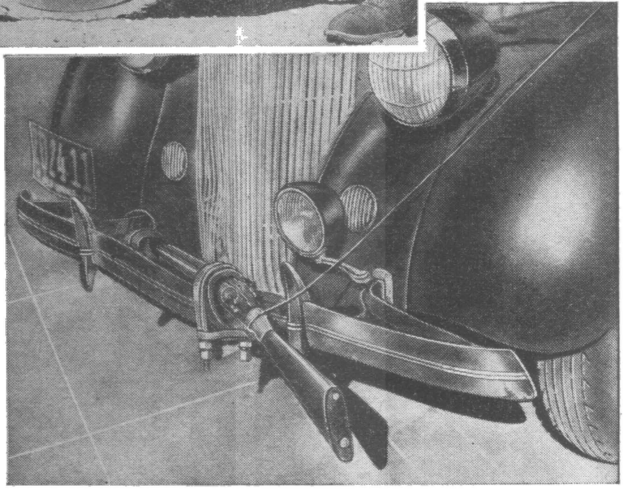
The smoke from the discharge can be seen at the side of the car. Note that the tire is only partly deflated.

AN auto tire, technically, does not go flat until the automobile on which it is located is brought to a stop. To his own satisfaction, and to scores of witnesses, Chris Sauer of Chico, California, has proved this point. In addition, he has perfected a revolutionary, new automobile wheel which he claims will forever banish any danger attending a blowout, and by thrilling experiments, which involve shooting away the tire when the automobile is traveling at 75 miles an hour, he demonstrates that the car does not get out of control and is as safe to drive as if it were equipped with every conceivable form of safety gadget, including the new duplex safety tubes.

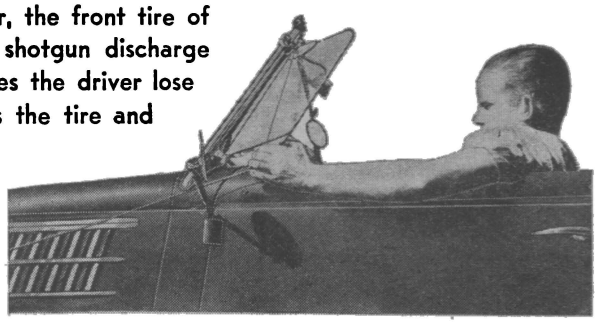
Working on the theory that a tire does not go completely flat when the air pressure is suddenly released by a blow-out and that the resultant jar is

Left — Although the tire has been torn to shreds after running eight miles following its deliberate destruction, it is still fastened to the wheel. With this construction there should be no danger to a front tire blow-out.

The shotgun is clamped to the bumper as illustrated in the photograph below. The trigger is released by pulling on the wire.



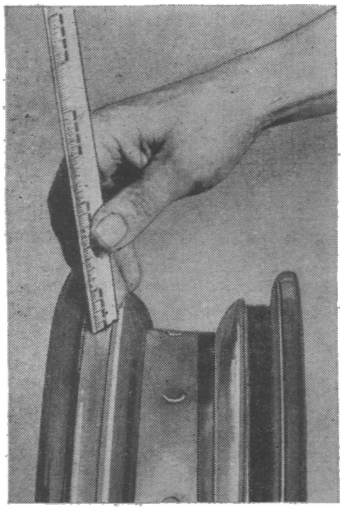
Traveling along at 75 miles an hour, the front tire of the automobile is destroyed by a shotgun discharge yet the car neither swerves nor does the driver lose control because a special rim grips the tire and prevents it from being torn loose.



The driver fires the shotgun to blow the tire by pulling this wire. Observe that when doing so he is driving with only one hand and yet the car does not waver from its course.

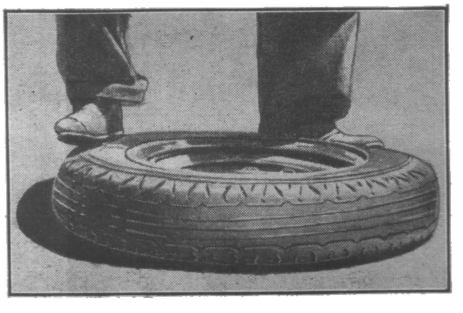
not sufficient to send a car careening off of the highway, he has invented a method of holding the tire tightly to the wheel.

He built a wheel with small metal flanges extending around on the inside of the wheel for approximately its entire circumference. Between each flange, which is 3/16" high, and the outside wall of the rim, the bead is gripped tightly when the tire is inflated. The beads will not come out of their channels even when the tire blows out. In this manner the tire and wheel remain one unit instead of becoming two separate pieces; in ordinary cases, when they become separated, they set up excessive vibration, which the driver finds impossible to control. It is this condition which causes him to wreck the automobile.



The ruler demonstrates the flange on the wheel which keeps the bead of the tire fastened in place. Below — By stepping on a certain spot of the tire it can be removed from the special wheel just as easily as can any tire from a conventional wheel.

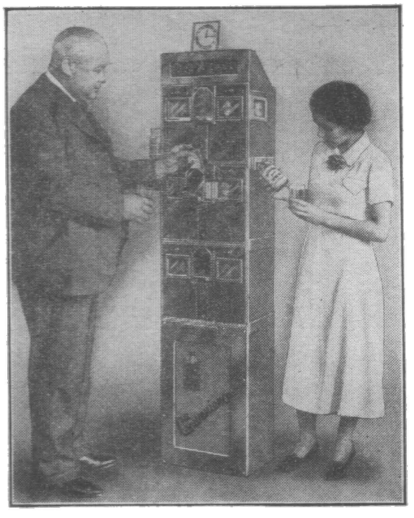
This is the appearance of a tire after a run of 75 miles an hour following a blow-out.



In the present construction, the only way in which the tire can be removed without being destroyed, is by two small openings in the flanges. By placing a foot on the tire and pressing down, the tire is released and can be removed. The tire can be put on by hand and regular tire tools.

Even when flat, the tire still is bound securely to the wheel and the speed of the car, generating cen-

(Continued on page 91)



Beer Dispensing Robot

A NEW experiment is being tried in London, England, in the form of an automatic machine which dispenses a can of beer whenever the customer puts six-pence into the mechanism. A can opener is found on the right and glasses, or drinking cups, on the left. However, in England, the hours for the sale of beer are regulated, hence each beer machine has a clock at the top which is kept five minutes fast. Should any coin be dropped into the robot "after hours," the money is returned. As for purposes of licensing, the mechanism holds a rating as a "public house."

And Then the Earth Sank!

ONE of the strangest examples of Nature's destructive force was recently observed near Buhl, Idaho, on a farm owned by H. A. Robertson, who recently discovered that hundreds of square feet of soil had sunk into the bowels of the earth, forming a miniature canyon. A few days later more than five acres of rich land disappeared, developing fissures 125 to 200 feet deep.

There are two theories as to the cause of such a phenomenon. The first considers the possibility of a subterranean river into which the earth had fallen. The second, and one which has the support of the geologists and seismologists, holds that there is a great fissure fifty miles or more below the surface of the earth which is being filled from above.

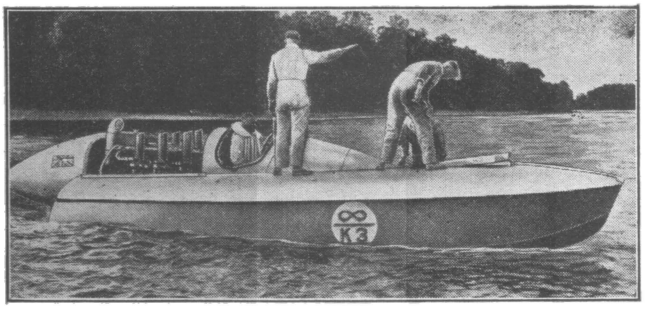
Farmer Robertson, leaning on a spade while trying to figure out how he will cultivate his land, huge areas of which were swallowed up by the earth.

The scientists believe that some day the earth above this fissure will break up and drop over a much more extensive area, and when it does, a major earthquake will occur which will shake the entire central portion of the United States.

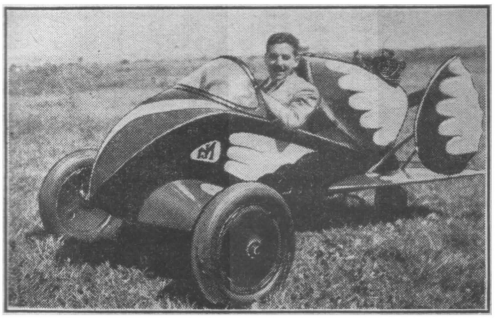
Robertson, capitalizing on his "misfortune," now charges 25c admission.

Holds World's Motorboat Speed Record

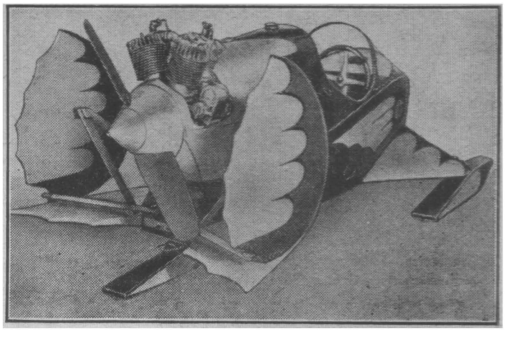
USING the same two-thousand horsepower twelve-cylinder airplane engine that powered his record-holding 301.13 miles-per-hour automobile, Sir Malcolm Campbell established a world's speed record of 126.325 m.p.h. in a twenty-three foot specially designed boat, on Lake Maggiore in the Swiss Alps.



The two-ton single-engined Bluebird which holds the world's speed record for motorboats.

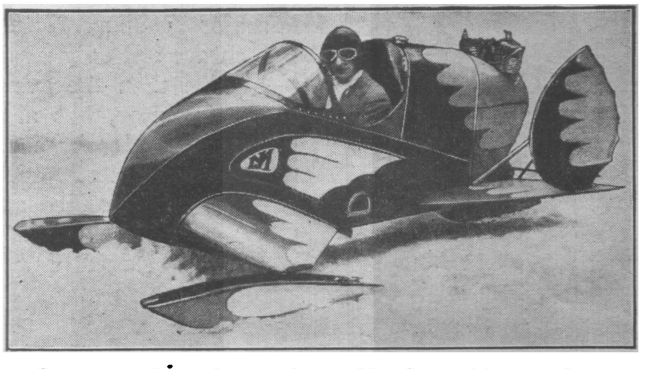


The inventor operating his unique airplane—without the wings—in automobile style. When the wings are applied the construction operates like a low-wing monoplane.



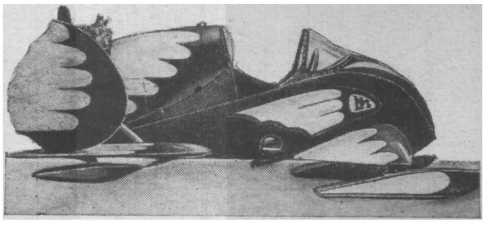
Unique airplane is provided with pontoons, skis and wheels. When the wings are removed they are strapped to the sides of the vehicle (or left in the hangar) after which the machine is used in the conventional manner on land or water.

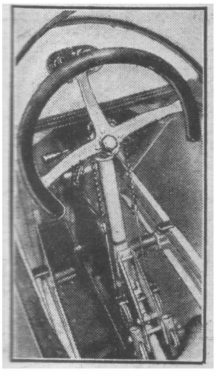
The Flying Auto

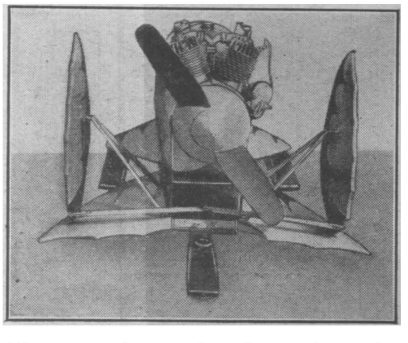


On snow and ice the auto is capable of surprising speeds.

Right, three-quarter rear view of the flying auto fitted with skis for operation on ice.







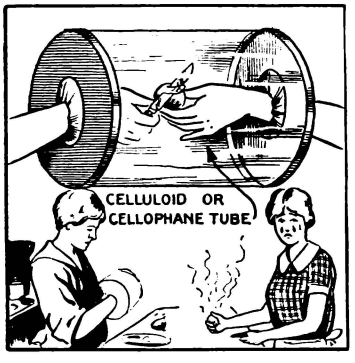
The two photographs above show the tail view and the controls in the cockpit.

THE mechanism illustrated on this page and also portrayed on the front cover of this issue, is a craft which might be characterized as a flying-wing sled, car or boat, designed and built by Jules Mandelker, a youthful Canadian (Montreal) engineer. It is quite apparent that with such a craft one could fly to the airport, dismantle the wings and run home on the power-driven fuselage, and it does not make any difference whether the route to one's destination is over snow, ice, water or negotiable roads, because, in a few minutes the wheels can be removed and either pontoons or skis substituted for them. Complete, the mechanism weighs 195 lbs., carries fifty pounds of gas and oil and weighs 500 lbs. with wings and ready to fly. On smooth ice it travels 100 miles an hour. It is powered with an 80 cubic inch supercompression motor driving a special 3′ 7½″ propeller.

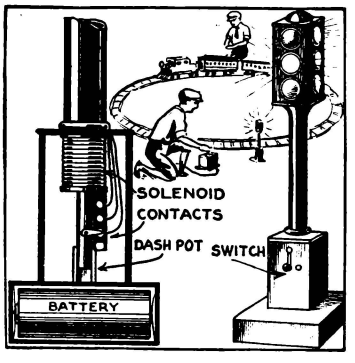
WHAT TO INVENT

In this installment of this series of articles, the author presents some new problems for inventors. The right solutions and subsequent exploitations should bring the designers wealth and fame.

By Raymond Francis Yates



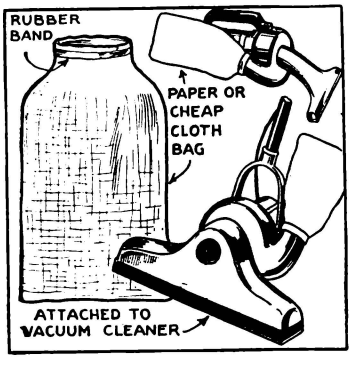
Left—A simple construction in the form of a celluloid "muff" would act like a gas trap for the lowly onion and "deaden" its lacrimatory properties.



Right—It should be very simple for an inventor to develop a small traffic light which will work automatically. In the suggested form a solenoid raises the switching mechanism which descends gradually.

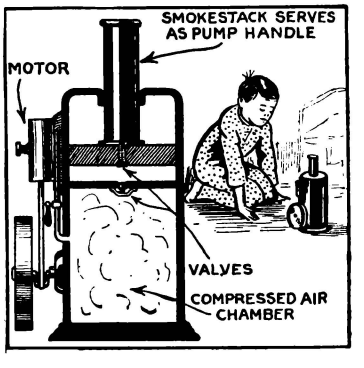
AS OFTEN as not, the man who slaves and sacrifices for years in an effort to perfect some new and complicated mechanism like a new Diesel engine, an automatic printing press or an oil burner, does not make any more with his idea than does the gadgeteer who places on the chain store counters of the country some useful little device that can be sold in large numbers for 10 cents each. Also the risks involved are infinitely greater in the case of the fellow who develops the new and complicated machine. For one thing, complicated machinery requires painstaking and costly patent protection; a single patent may cost several thousand dollars if the job is done carefully by expert counsel. Secondly, the competition is apt to be very great; large corporations always have groups of qualified men at work on major problems. These men are not only more capable than the average inventor, but also have the advantage of great resources, equipment, and qualified assistance. The writer's advice to the casual inventor is to shun problems of this kind and to exercise his talents on simple things. The reward is often as great and the chances for grief are considerably lower. One can easily waste half a lifetime perfecting a large machine, only to find that some corporation evolved a better solution.

And speaking of small gadgets, have



Right—A highly efficient compressed air engine would make a good toy. Means should be provided for replenishing the supply of air.

Left—Someone should develop a porous paper bag to take the place of the cloth bag used on vacuum cleaners. When the cleaning has been done the bag is merely pulled off the outlet whereupon it seals itself.



CAN YOU INVENT THESE THINGS?

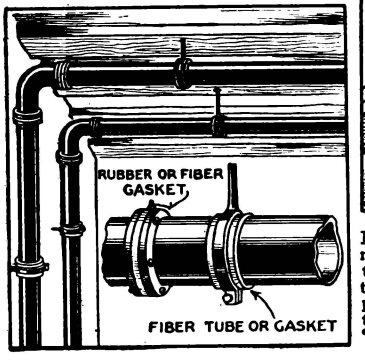
Millions Being Made with New Inventions; America Needs New Gadgets.

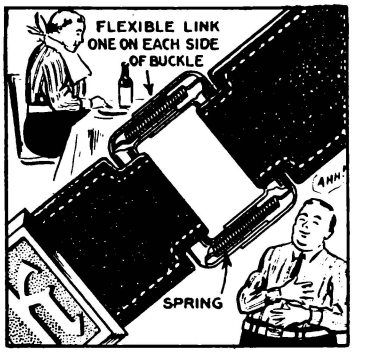
the readers of this department ever contemplated the problem of peeling the lowly onion? The eyes of many women are so sensitive to the volatile oils given of by this member of the vegetable family that they cannot peel an onion without actually suffering great discomfort. Can't our gadgeteers devise some sort of a little contrivance to prevent this? Imagine what Woolworth's would do with a gadget of this kind!

The clever inventor is a keen observer; he is looking for things to improve, no matter where he may be. The soda fountain today is playing a large part in American life; here the inventor will find many opportunities to ply his trade. Let us examine the methods of washing glasses. Several operations are now necessary for this job. Can it be done in one? Why not a flushing, rinsing and sterilizing "all-in-one" operation? The right answer to this would find at least 20 large fountain manufacturers ready to bid for the result.

What would the home owner give for a sink trap which could be agitated from the outside to relieve congestion? There seems little reason why a plumber should have to be called in for such a small matter.

Right—Spring links are used on watch bracelets. Why not adapt similar but stronger members to a belt. These would make allowance for expansion of girth.



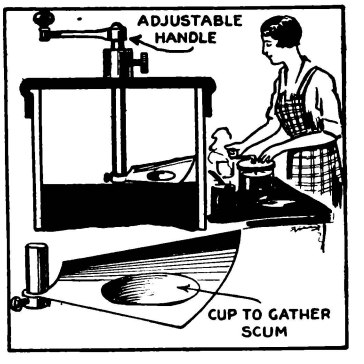


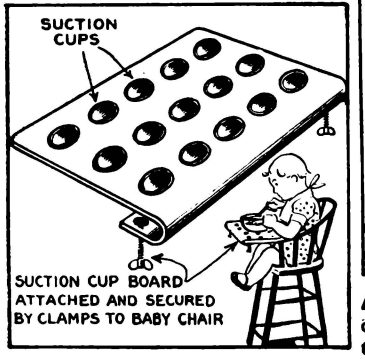
Left—Much of the clanking and noise in pipe lines is due to the fact that they are not insulated from their hangings and furnish a perfect path over which sound waves can travel. Breaking them up with "sound" insulators should remedy the situation.

Christmas time is coming and once more millions of dollars' worth of toys will be sold in this country. Strange as it may seem, no inventor has ever supplied our youngsters with a toy traffic light. We have all of the essentials for such a thing; all we need now is for some clever person to put them together. On the list of available material, we have tiny electric lights, cheap flashlight batteries, and spring motors beautifully suited to actuate the

(*Continued on page 94*)

The item at the right is a suggested form of skimmer to be used when making jelly. The blade scoops up the scum, which is deposited in a receptacle. The height of the skimmer can be adjusted.



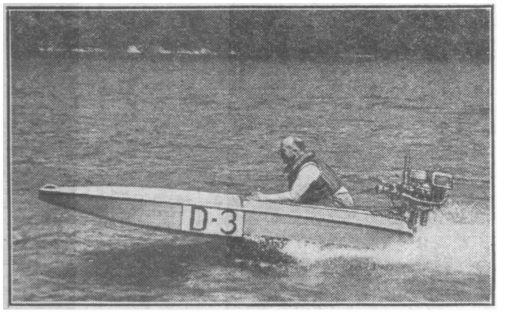


A metal plate, studded with vacuum cups, would prevent the baby from tossing her food plate onto the floor.

Candid

Part 3

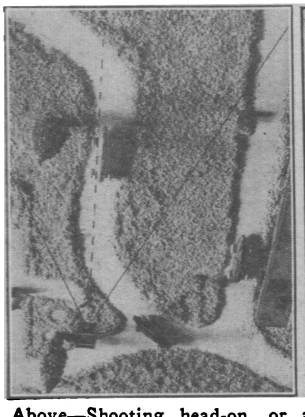
Shooting Speed



Even a slowly moving subject, if shot broadside and very near the camera, will show some blur of motion if a slow exposure is given (see photo at left). Almost as close to the camera is the photo of this boat moving at forty miles an hour. The exposure was 1/1000th second, but the camera was swung in the direction of the speeding craft at the time the exposure was made.

STOPPING a speeding car "cold" seems to be the height of ambition for most amateurs, and it isn't hard to do—if you know how. But if you don't know how it is done, the finest camera in the world will just give you a blur. The other side of the story is that good pictures of speeding objects can be made with an ordinary, inexpensive Kodak. It's all in knowing how; even the news man with his fine cameras uses this knowledge every time he makes a shot.

There are different kinds of speed—ordinarily we usually think of the speed



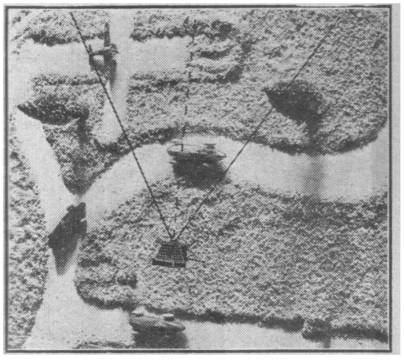
Above—Shooting head-on, or at the tail of an object moving away from the camera, will produce sharp pictures without a blur even with slow shutter speeds. In this photo-diagram the dotted lines represent the optical axis of the lens and the solid lines indicate the limit of the field.

Right—Failure to take cognizance of the acceleration of speed due to gravity results in blurred pictures.

Photography

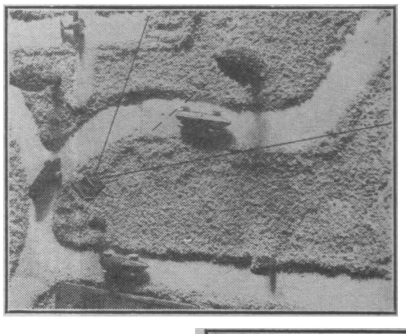
By Herbert C. McKay

of a racing car—a definite velocity in a given direction. But suppose we are considering a racing horse running at, let us say, thirty miles an hour. That horse is moving forward forty-four feet each second. If he is taking six feet at a stride, he is making, roughly, eight leaps a second. The feet on the ground are fixed so the body moves 44 feet a second faster than the feet on the ground, but as a stride takes about 1/8 second, we assume 1/12 second on the ground and 1/24 second for recovery. This means that on the forward movement of the feet, the feet not only partake of the motion of the body, but also move forward a distance of six feet in 1/24 second, or at the rate of 144 feet per second; this is more than three times as fast as the animal moves. Thus, the legs move at a rate of about 100 *miles an hour*. The same thing is found with fighters, acrobats and other subjects, where the arms or legs are in rapid motion, regardless of the motion of the body.

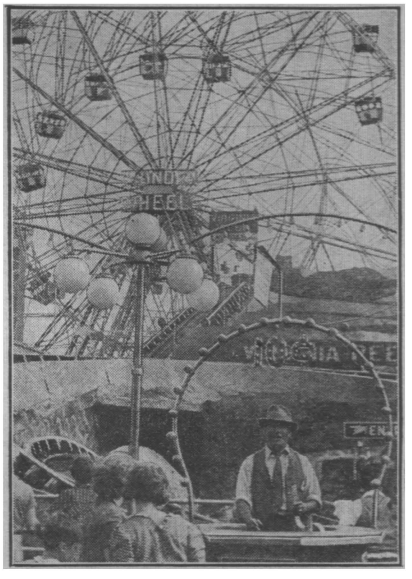


The movement of a Ferris wheel is relatively slow and when photographed at a distance will produce a sharp image even at low shutter speeds.

Shooting directly broadside is apt to produce a blur unless the shutter speed is very high (see photo-diagram at the left).



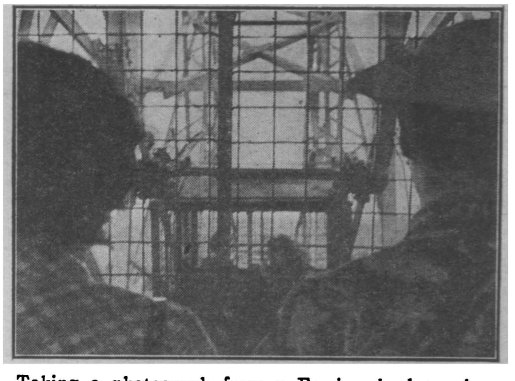
Shooting at an angle permits a much lower shutter speed without danger of blurring, if the object is snapped before it passes the optical axis.



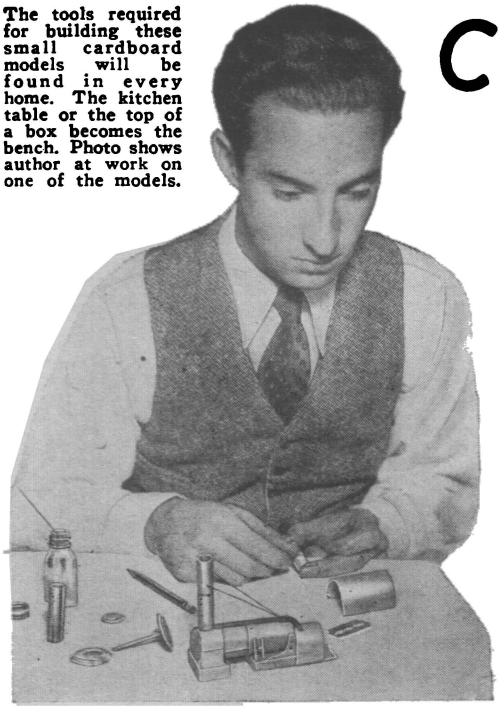
Next we have the oscillating motion; this is any kind of reversible, cyclical motion; for example, the motion of a swing, pendulum, or a dance figure in which there is repetition.

In the first type of motion we must calculate our exposure on the basis of the motion of the object. In the second case, this exposure must be made

(*Continued on page* 83)



Taking a photograph from a Ferris wheel to show another part of the wheel at the opposite side requires great shutter speeds because both the camera and the object being photographed are moving in opposite directions.



The tools required for building these small cardboard models will be found in every home. The kitchen table or the top of a box becomes the bench. Photo shows author at work on one of the models.

Cardboard Models

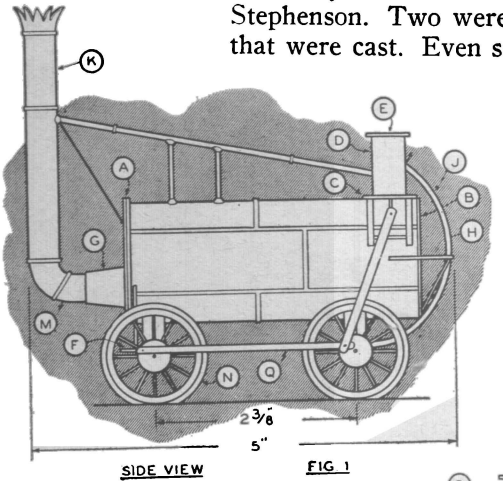
Hackworth-type Locomotive

By Herbert Lozier

THE year 1829 saw the actual beginning of the railroad as a passenger carrying conveyance. To be sure, railroads had been built before that date, but most of them were being utilized for carrying ore and coal in mines. The success of these prompted the Stockton and Darlington Railway to offer a prize of £500 for the best locomotive conforming with certain specified conditions.

The trials held at Rainhill, England, proved the suitability of the steam engine for railway haulage in general. In these trials were Stephenson's "Rocket," the "Novelty," and Timothy Hackworth's "San Pareil." The latter was chosen as the prototype for the model presented here because of its simplicity of construction. It is interesting to note some of the information given about this locomotive in an old article published in 1830. Its weight is given at 40 tons and the boiler, built by the Bedlington Iron works, was one of the first to use welded construction. However, it proved leaky and had to be re-calked with copper several times.

The cylinders were made by Messrs. Stephenson. Two were chosen from six that were cast. Even so, during the trial one of them burst, forcing



SIDE VIEW FIG. 1

The parts in these diagrams are lettered correspondingly. Thus, after you make up one of the smaller pieces shown in the other figures, you should have no difficulty in locating it properly on your model.

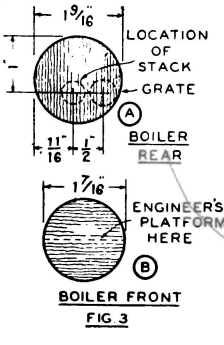
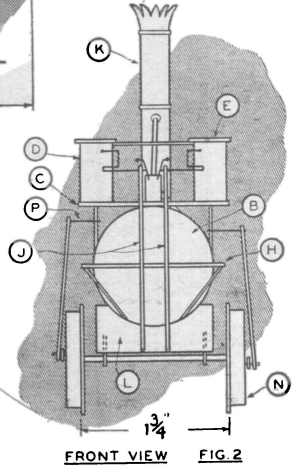


FIG. 3



FRONT VIEW FIG. 2

This is the first of a series of cardboard scale models of historic locomotives. All of them move and if the work is carefully executed the builder will have a very creditable museum of history-producing iron horses. Inasmuch as all will be built to the same scale, a glance will convey to the observer comparative changes in size of engine and track.

the engine to complete the run on only one cylinder, which came near repeating the process.

The heating surface consisted of a double tube traversing the whole length of the boiler and returning to the fire end, which, together with the fire-grate, was at one end of the engine. The fire-grate was in one tube and the chimney or stack in the other. The wheels were of wood with iron rims to hold them together.

The model's construction is as simple and accurate as the author could make it. You should experience little or no trouble in an effort at duplication.

For tools you need only a razor blade, scissors, glue (a quick-drying kind only), pins, and paint.

If the builder wishes to make the model of metal, he

This photograph gives the reader a good idea of the size of the model. The Hackworth locomotive ran "backward"; that is, the smoke stack was at the rear, the engineer standing on the platform at the front. The model is painted black with gold cylinders, red driving rods and green wheels.

A short section of track will improve the appearance of the model.

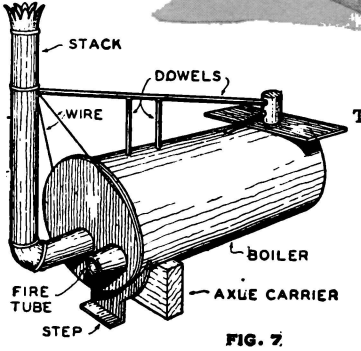


FIG. 7

The rear end assembly is given in the diagram at the left.

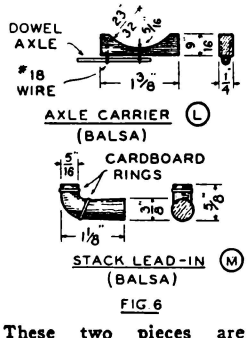


FIG 6

These two pieces are carved from balsa, then sandpapered smooth and mounted.

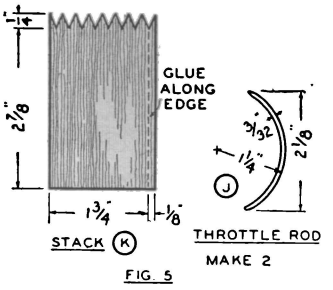


FIG. 5

After the stack is made the top is flared out. When painting, trim stack bands with gold.

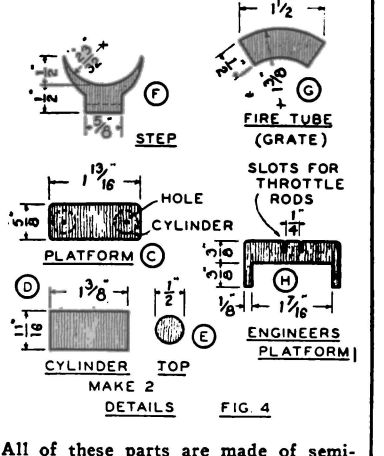


FIG. 4

All of these parts are made of semi-stiff cardboard. The cylinder and fire-grate tube are rolled around a pencil before gluing.

may follow the construction outlined, substituting solder for glue, and metal wheels for the cardboard and wood specified here.

Begin with the boiler first; obtain a tube of cardboard 1-7/16" in diameter and cut off a section 3⅜" long. Then make the boiler ends (Fig. 3); there are three, two large discs which go to the rear, and a single small one for the front. Make the smaller one of heavy cardboard. When they have been cut out, glue them to the ends of the tube, sealing it at both ends. Set the boiler aside to dry.

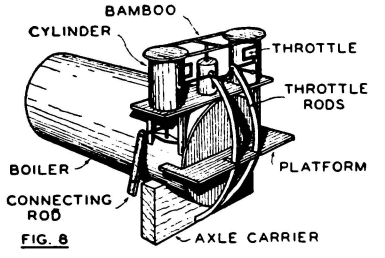
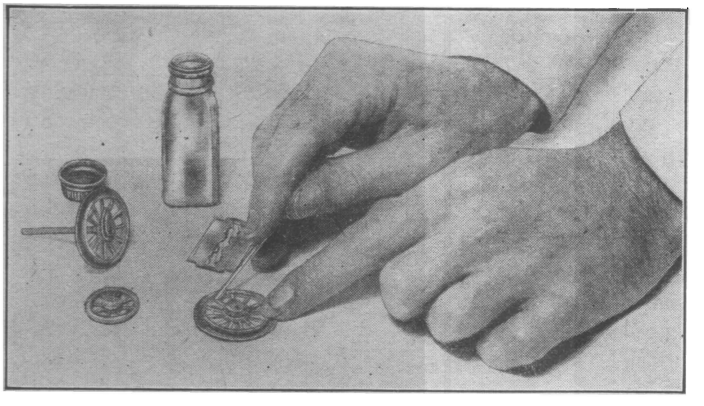


FIG. 8

This diagram illustrates the front end assembly of the locomotive. In the model the connecting rod moves up and down, but the "piston" does not.

The cylinder platform, cylinders, fire-grate tube, engineer's platform, and the piece beneath the fire-grate may be cut out now. They are made of semi-stiff cardboard (Fig. 4). Roll the parts for the cylinder and fire-grate tube around a pencil before gluing them together. Hold them together with a pin until they are dry. Cardboard has a grain, and bends more readily in a direction parallel to the grain. The line shading shows the direction of the grain.

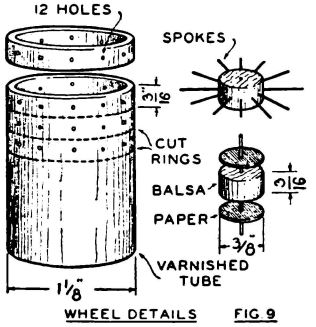
Glue the engineer's platform in position on the *front* of the boiler and set the wooden braces below it. When the platform has dried, add the two curved throttle rods. These rods (Fig. 5) should touch the axle carrier below the boiler as shown on the plan.



Here the author is making up one of the wheels for the locomotive.

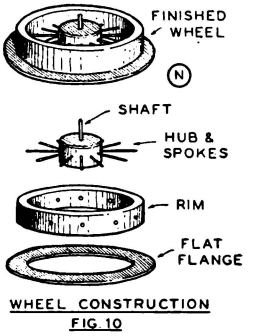
The complete cylinder and cylinder platform may be built now. Glue the cylinders to the platform, then add the two bamboo strips that serve as the steam pipes be-

(*Continued on page* 88)



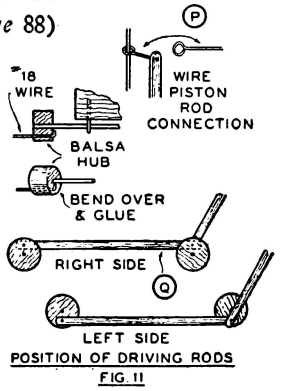
WHEEL DETAILS FIG. 9

The cardboard wheels are made up as illustrated by these details.



WHEEL CONSTRUCTION FIG. 10

The final stages in wheel construction are given here.



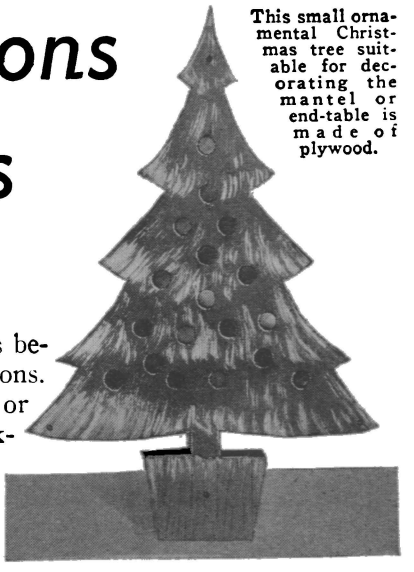
POSITION OF DRIVING RODS FIG. 11

By this method the builder will be able to get some motion with his model.

Novel *Decorations for Christmas*

By H. L. Weatherby

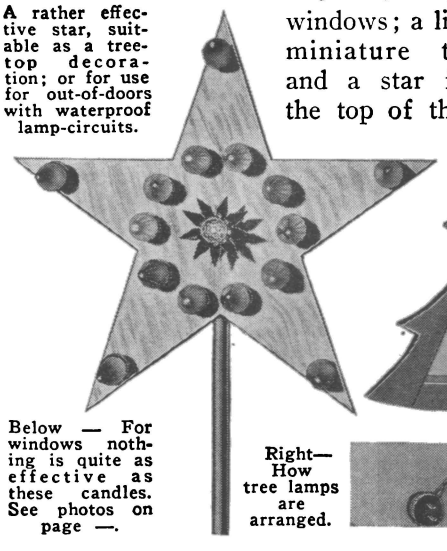
AS the Christmas season draws near, most of us begin to cast around for new ideas in decorations. As an outlet for the creative individual, plywood, or a good grade of wall-board, offers a medium of expression that should not be overlooked.



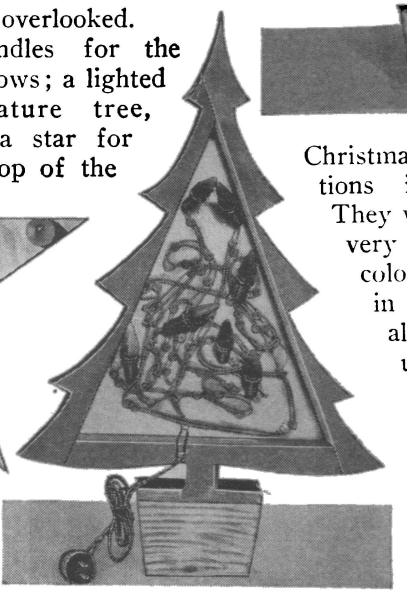
This small ornamental Christmas tree suitable for decorating the mantel or end-table is made of plywood.

Candles for the windows; a lighted miniature tree, and a star for the top of the Christmas tree, are all suggestions illustrated herewith. They were made easily at a very small cost. Water color (or poster paints) in white and green, and aluminum paint, were used in their decoration. The wiring was simple; the usual Christmas eight-bulb string of lights was attached and the lights were distributed to their

(*Cont. on page 72*)



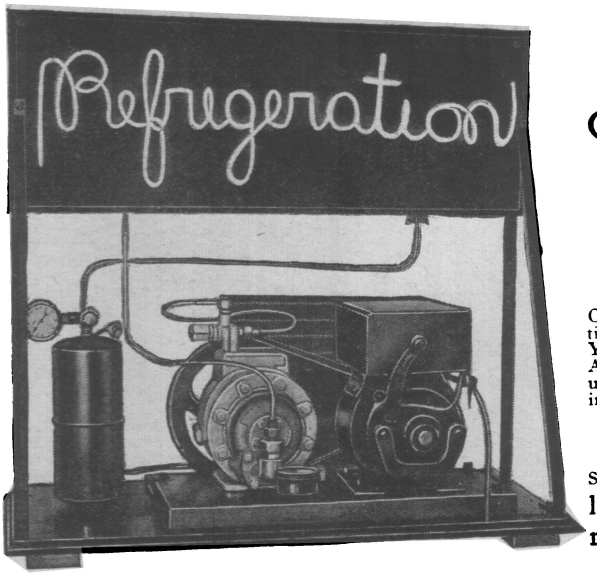
A rather effective star, suitable as a tree-top decoration; or for use for out-of-doors with waterproof lamp-circuits.



Right—How tree lamps are arranged.

Below — For windows nothing is quite as effective as these candles. See photos on page —.

ELECTRIC CANDLES FOR CHRISTMAS WINDOWS
Electric candles for Christmas windows are easily made at very small cost by the home craftsman who has a band or jig saw. They are simply pieces of 3/8" plywood sawed to shape, and the design to fit the window.
Feet are glued to the bottom, and small blocks with holes to fit the light sockets to the top of the candles. Wire with an ordinary Christmas tree string of lights and use white or yellow bulbs. All wood should be painted flat white.
3/8" Plywood
Feet



Servicing

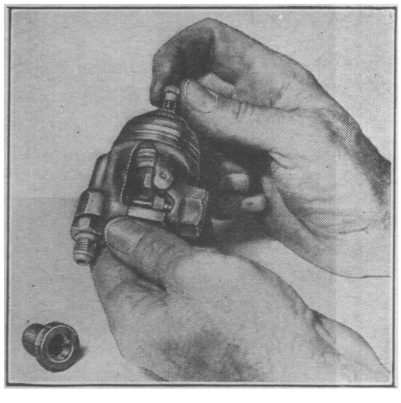
Part II

By L. K. Wright

Originator and Chief Instructor of Refrigeration Servicing Course at the New York Y. M. C. A. Trade & Technical School, Author of "Official Refrigeration Service Manual," Vols. I and II—"Official Air Conditioning Service Manual," "Commercial Refrigeration," etc.

A TYPICAL refrigeration unit found in many households is diagrammatically sketched in Fig. 1. Its main parts are compressor, condenser, receiver, throttle device (expansion valve) and cooling coil.

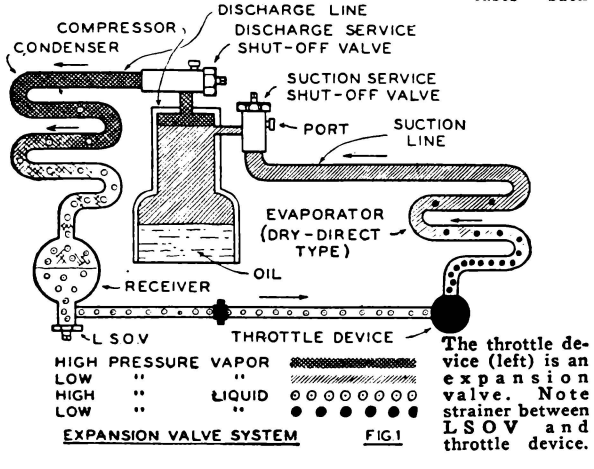
There are three main lines connecting this equipment, viz: discharge line, suction line and liquid line. The sketch shows these parts in their relation to other portions of the apparatus.



Cut-away view of an automatic constant-pressure expansion valve showing method of adjustment. Turning screw to right increases back pressure.

Compressors are made in two main types, rotary and reciprocating piston, the latter being the more popular and easier to service. Some rotaries are very difficult to repair, due to fineness of construction. Most reciprocating piston models are easy to work on and will be covered in this series.

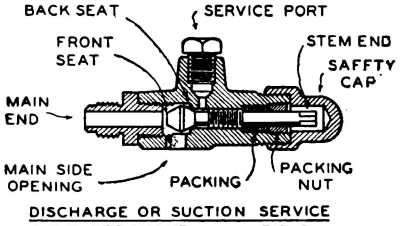
The compressor has three duties to perform. It must suck in vapor from the evaporator or cooling coil, compress it and then



EXPANSION VALVE SYSTEM FIG 1

The throttle device (left) is an expansion valve. Note strainer between LSOV and throttle device.

The diagram at the left shows the operation of a typical household refrigerator. Suction and discharge service shut-off valves are made as illustrated below. The method of seating differs with their use.



DISCHARGE OR SUCTION SERVICE SHUT-OFF VALVE FIG. 5

A series of articles from the pen of a well-known educator in the art of refrigeration. Preserve the entire series and you will have a valuable study course covering the servicing of standard household refrigeration systems.

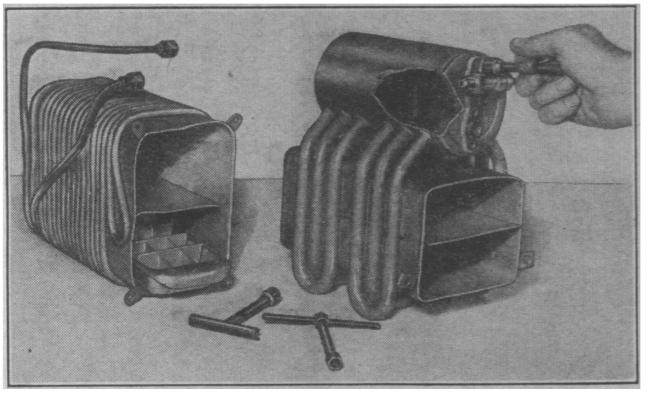
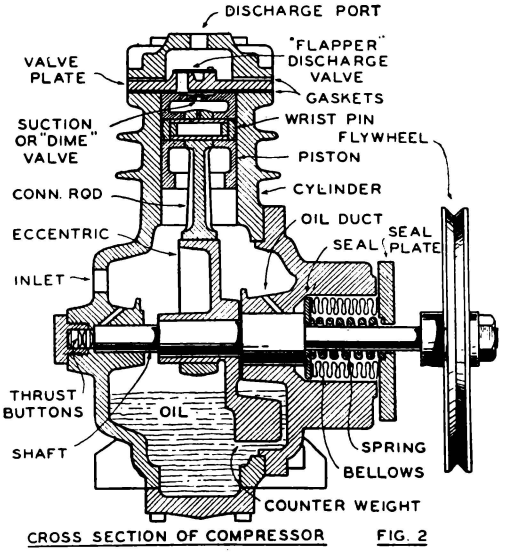


Fig. 3A — This photograph shows two different types of evaporators. The one at the left being a simple coil while the one at the right is like a boiler.

discharge it to the condenser. Thus, its duties may be said to be suction, compression and discharge. Refrigerant is caused to flow through the system as indicated by the directional arrows in Fig. 1.

A suction valve is generally located in the top of the piston. As a rule this valve is nothing more than a thin disc of steel, held in place by a perforated retainer disc or plate. When the piston is descending, vapor from the crankcase and from the evaporator lifts this small disc and enters the compression chamber. When the piston starts its upward stroke the vapor in the chamber causes the suction valve, or "dime" valve, as it is sometimes called, to seat, locking the gas or vapor in the chamber. Further movement of the piston serves to compress the gas. Just as soon as the pressure has risen to a point slightly above the pressure existing in the head of the compressor, it lifts the discharge valve off its seat and the compressed vapor is discharged past the discharge or flapper valve. This

(*Continued on page 72*)



CROSS SECTION OF COMPRESSOR FIG. 2

The typical pump-type compressor is given in this illustration.

Right—A strainer, usually interposed in the liquid line, removes dirt, grit, or metallic particles. For location see Figs. 1 and 3.

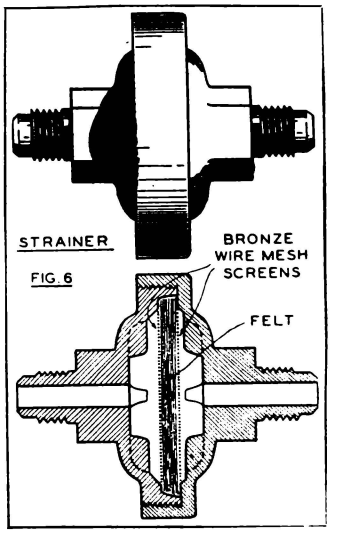
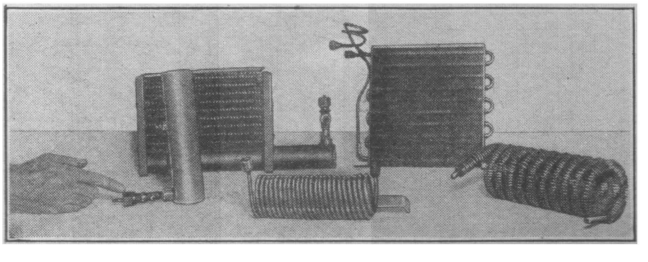


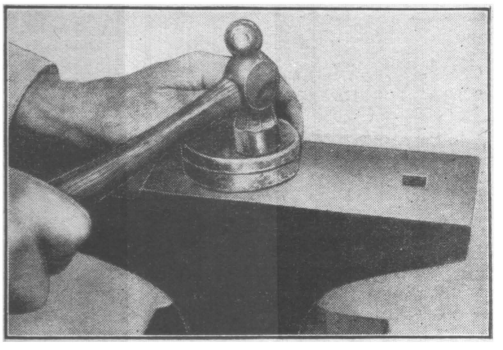
FIG. 6

The photo below illustrates several different types of condensers. Some are made of plain copper tubing and others have fins. Compare sizes with hand.



Handicraft in Metal

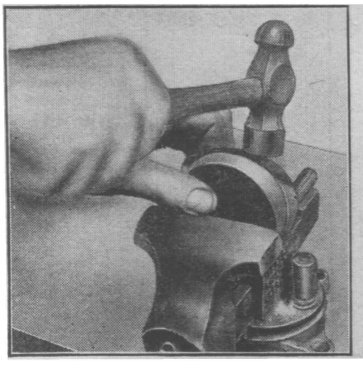
By Dick Hutchinson



The photo at the left shows a lamp made by attaching a suitable fitting to a vase. Of course, a shade should be selected to harmonize with the vase itself. The final stages for forming the cap are illustrated above.

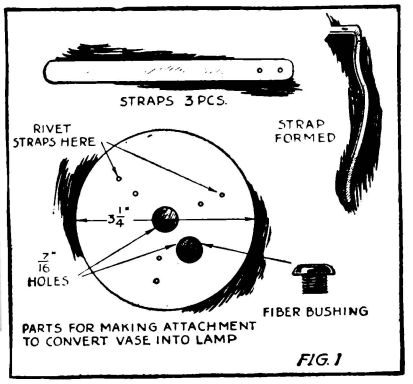
MANY of us have several vases around the house, which, if properly prepared, would make attractive and serviceable table lamps. This can be done without inflicting any damages on the vase. Of course, it is better to drill a hole at or near the bottom of the vase through which the lamp cord can be run, but this treatment is not necessary and it would spoil the vase if for any reason the owner desired to place it back into its original service.

The vase illustrated here makes a very attractive lamp. It is 10" high, and the top rim is 3¼" in diameter over all. A



The caps and base blocks for the lamps described are formed over hardwood blocks. Both cap and block are clamped in the vise as shown.

The finished lamp before the shade is attached will appear as illustrated above. If this construction tends to tip, the vase can be filled with sand.

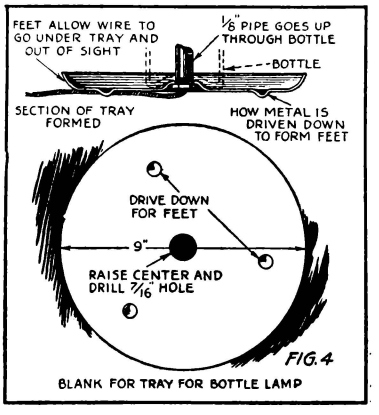


The metal fittings for the top of the vase are diagrammed above. For an illustration of this item see page 62.

In this series of articles the author has recommended the use of only the simplest tools. All working plans have called for material which can be obtained easily. In this article which deals with the making of table and portable lamps, this same "ideal" has been followed.

The standard of this lamp was an old bottle.

3¼" disc was cut from No. 18 gauge sheet copper, and hammered on one side. A 7/16" hole was drilled in the center, and the light socket attached with a brass fixture bushing. Another hole was drilled, and a fiber bushing was fitted into this for admitting the wire. Three copper straps, ½" wide by 4½" long, were cut, hammered, bent into shape, and riveted to the under side of the plate. The fitting was colored, polished, and lacquered, then wired with the necessary length of cord.

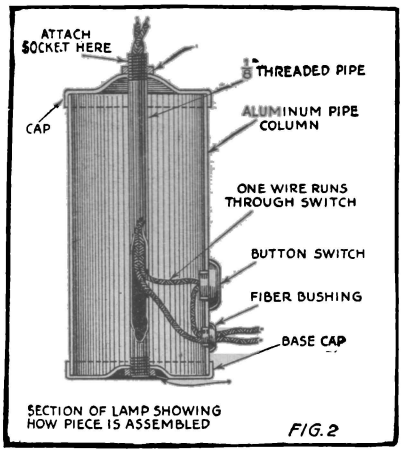

FEET ALLOW WIRE TO GO UNDER TRAY AND OUT OF SIGHT
⅛" PIPE GOES UP THROUGH BOTTLE
BOTTLE
SECTION OF TRAY FORMED
HOW METAL IS DRIVEN DOWN TO FORM FEET
DRIVE DOWN FOR FEET
9"
RAISE CENTER AND DRILL 7/16" HOLE
FIG. 4
BLANK FOR TRAY FOR BOTTLE LAMP

This diagram shows how to make the base for the lamp at the right.

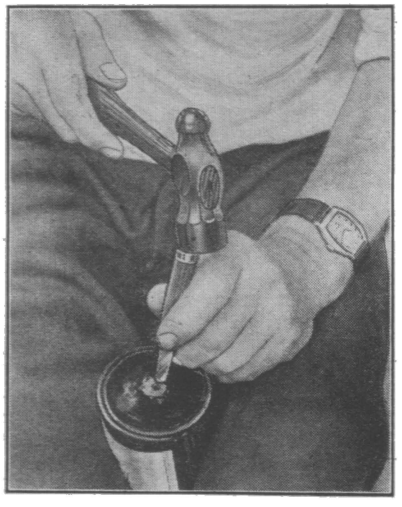
When the piece was completed it was set on the top of the vase, and the three strap springs were bent so that they held the plate down tight. A shade should be selected to balance with the particular type of vase used.

A beautiful lamp made entirely of aluminum is shown at Fig. 2.

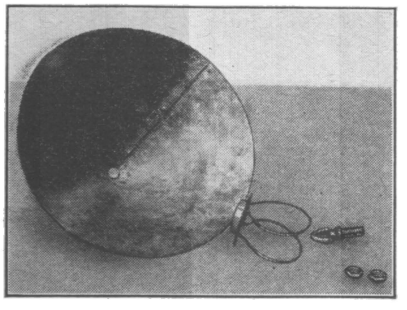
The column is a piece of 3" I.D. aluminum tubing, 6" long, with a 1/16" wall. The length of tubing is placed



The rather modern aluminum lamp, illustrated at the left, is shown without the shade in the photograph at the right. The constructional details are given in the diagram above. Arrows point to hex. nuts at top and bottom.

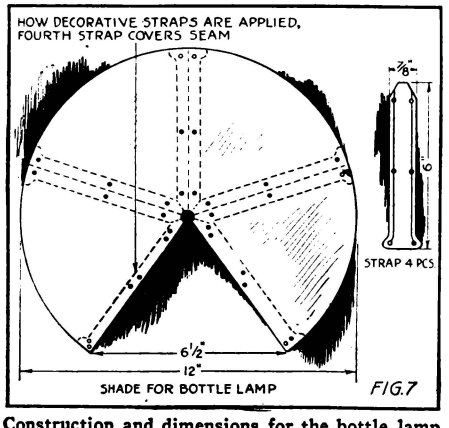


The method of cutting a hole in the bottom of a bottle is by tapping lightly the end of a center punch and working in around over a small circular area.



over the horn of the anvil, or a length of round iron pipe, and hammered all over.

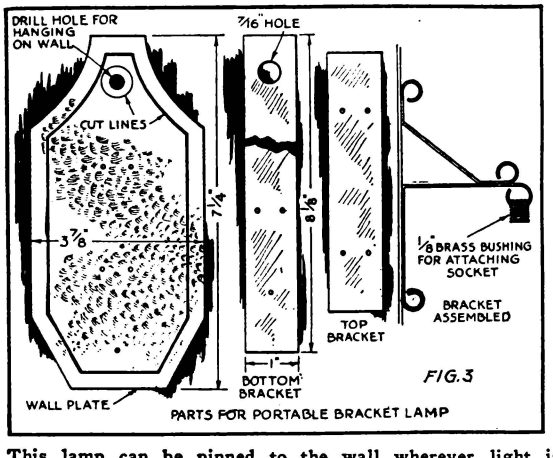
For forming the cap, and base cap, cut a hard wood block 3⅛″ in diameter, and 1″ thick. Now cut out two discs of No. 18 gauge sheet aluminum, 3⅝″ in diameter; placing one of the discs on the wood block, clamp the whole in the vise, as illustrated, and hammer the edge down evenly all around against the block. Remove and true up, and hammer the face. Repeat the operation with the other disc. Place cap over a lead block and raise the center from the inside. A 7/16″ hole is drilled through the center of both cap and base cap to receive the ⅛″ pipe. The base cap is placed over a lead block, and a slight indentation is made with the ball end of the hammer. This is to accommodate a ⅛″ fixture nut, which measures about 11/16″ in diameter.

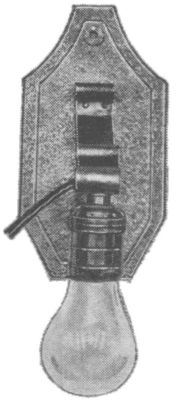


Construction and dimensions for the bottle lamp shade are given in this diagram and in the upper photo.

Two 7/16″ holes are drilled on one side of the column, the first ½″ up from the bottom, and the second 1″ higher. Fit a fiber bushing into the first hole to admit the drop cord, and insert a button switch into the other hole. A 7″ length of ⅛″ threaded pipe is used to bind the lamp together and also for the wires.

Cut a hole through the side of the pipe to receive the wires. Run the wires in through the fiber bushing. One wire goes to the button switch, and the



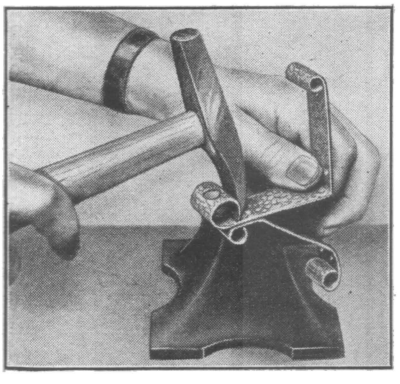


This lamp can be pinned to the wall wherever light is needed. Bracket details are given in the diagram at the left of the photo.

other direct; then thread the two wires through the pipe; don't scrape insulation.

Place the base cap over the lower end of the pipe and tighten up with a hexagon fixture-nut. Place the cap over the other end of the pipe and draw this down with another nut. Screw a socket onto the upper end of the pipe and attach the wires. Burnish the whole piece lightly with fine steel wool. No lacquer is necessary.

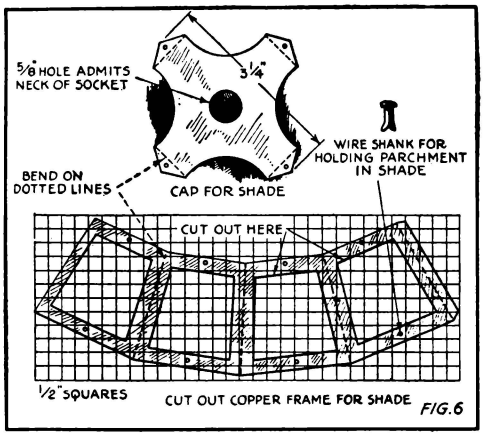
White or silver drop cord and a white or silver shade, to carry out the color scheme, should be used (or select your colors).



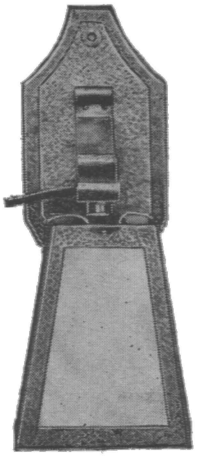
The method of riveting the bracket for the portable wall lamp is shown in this photograph.

A portable side-wall lamp and shade, to plug into any outlet, and hung wherever desired for reading, etc., is illustrated in Fig. 3.

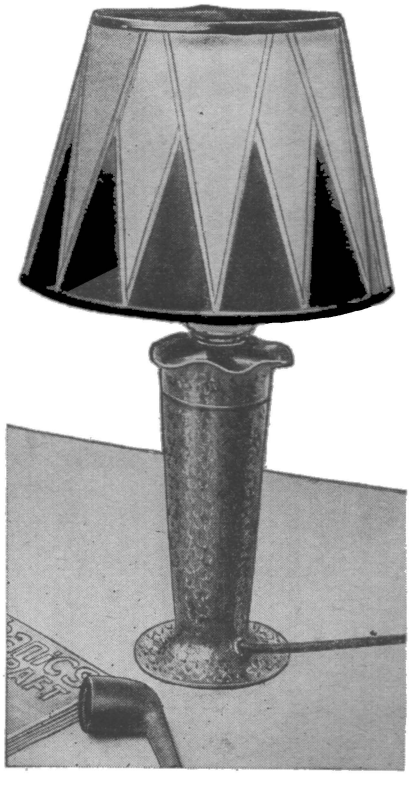
The plate is of No. 16 gauge sheet copper, cut out as shown. A line is cut in ½" from the edge all the way around. A hole is drilled in the center of the top for hanging, and a line is cut around this. The outline is hammered with a planishing hammer, and the panel is decorated with the paneling tool, described in a previous article. The bracket is cut from the same material, hammered, bent into shape, and riveted in place on the plate.



Pattern for the shade and support, or cap, is detailed here.

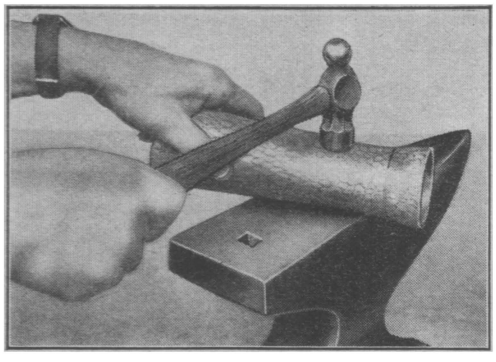


The finished lamp with its metal-edged parchment shade.

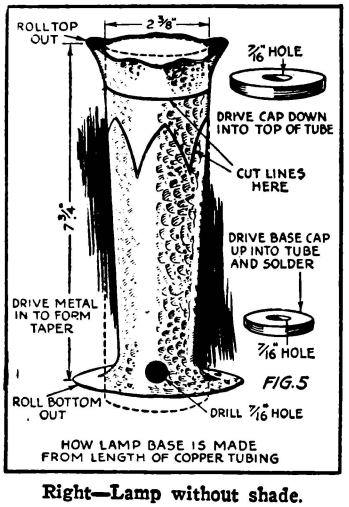


A very pleasing two-toned lamp can be made from a length of copper tubing.

The shade is made from No. 22 gauge sheet copper. The openings are cut out with a sharp cold-chisel. The outside is hammered, the piece is bent to shape as shown, and the open corner is overlapped and soldered. The cap is cut from the same material, hammered, raised slightly in the center, and is bent and riv-



The tube is driven in so as to taper near the bottom, but the bottom itself is left large so that it can be spread for the base. The diagram at the right illustrates the stages in the development of this type of base.

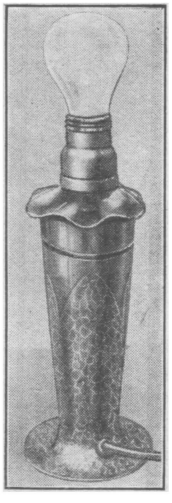

ROLL TOP OUT
2 3/8"
7/16" HOLE
DRIVE CAP DOWN INTO TOP OF TUBE
CUT LINES HERE
7 3/4"
DRIVE BASE CAP UP INTO TUBE AND SOLDER
DRIVE METAL IN TO FORM TAPER
7/16" HOLE
FIG.5
ROLL BOTTOM OUT
DRILL 7/16" HOLE
HOW LAMP BASE IS MADE FROM LENGTH OF COPPER TUBING

eted in place. The light socket is inserted through the cap of the shade, and screwed onto the brass fixture bushing in the bracket. Parchment paper is used for the shade, and is held in place with small wire shanks. The wiring is done through the ring at the end of the bracket where the socket is attached. The piece may be polished, or colored as desired.

A great variety of ordinary bottles will make interesting and attractive lamps. Bottle lamps are very popular, however, nearly all of them being wired at the top in one way or another.

The drilling of a bottle is a simple project, and may be done by anyone if time and care are taken with the process. Fill the bottle full of dry sand, and pack in all that it will hold, then force a tight cork into the neck of the bottle.

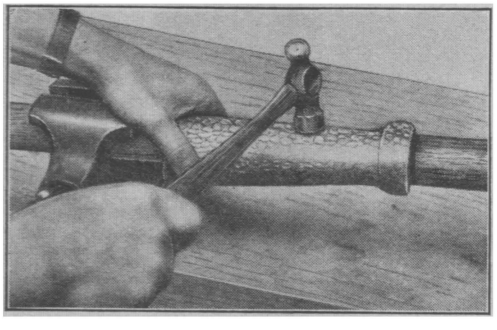
Place the bottle, bottom up, between the knees and, with a hammer and a center-punch, begin chipping a circle a little larger than the hole desired, in the center of the bottom. Strike very lightly, going around and around until the piece drops out, but do not try to chip from the center or the bottle will crack and go to pieces. It will take about twenty minutes to drill the ordinary bottle. The lamp illustrated was made from a beer bottle, and the assembly becomes a fitting lamp for a den.



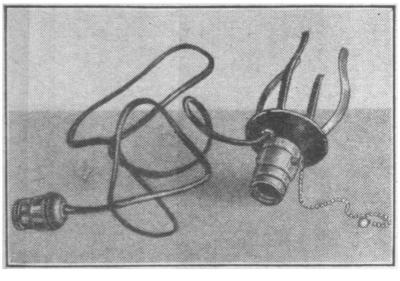
Right—Lamp without shade.

The base of this lamp is a 9" disc of No. 18 gauge soft sheet copper. The rim is raised to a depth of about ½" and the center is raised to accommodate a ⅛" hexagon fixture nut; a 7/16" hole is

(*Continued on page* 96)



The base of the lamp is ornamented and shaped further by hammering on a piece of pipe held in the jaws of a vise.

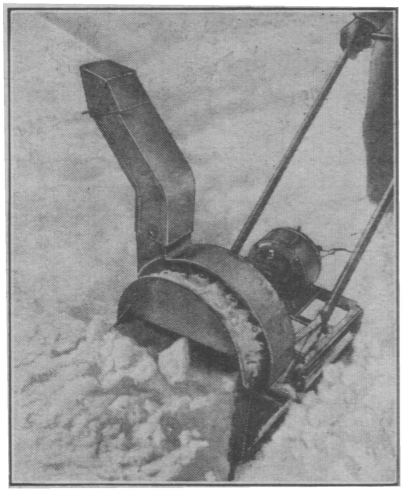


This is the complete attachment which converts any glass or earthenware vase into a lamp. Refer to first page of this article.

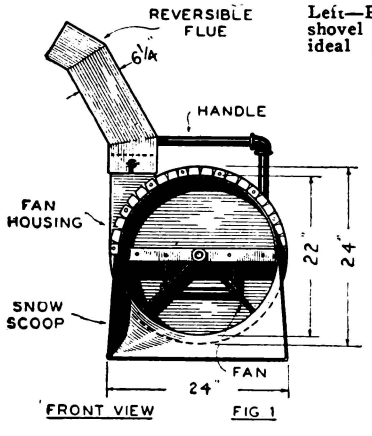
Motorized Snow Shovel

EVERYONE has seen, in the newsreels, at least, the huge rotary snow plows used by the railroads to clear their tracks after a heavy snowfall. Here is a small-scale version, which will quickly and easily clear your sidewalks, even after a blizzard. The model shown is driven by an electric motor, but a small gasoline engine could be used instead. The gasoline engine has the advantage of not requiring the long wire needed to connect the electric motor with an electric outlet. The small single cylinder gas engine of a power lawnmower would be excellent. However, as small electric motors are much more easily obtainable, the drawings show such a motor.

(*Continued on page 87*)

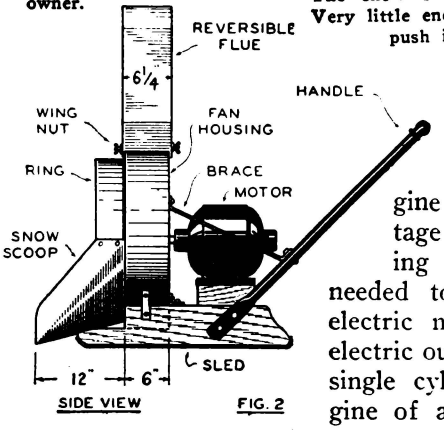


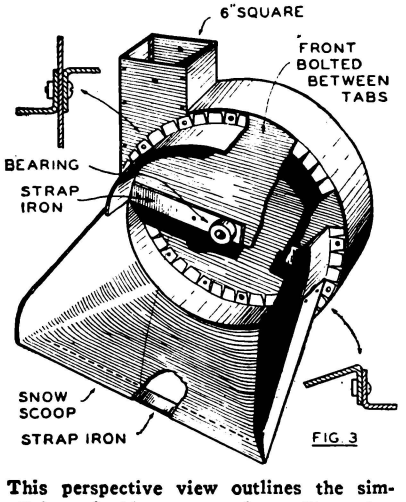
The snow shovel in operation. Very little energy is required to push it forward.



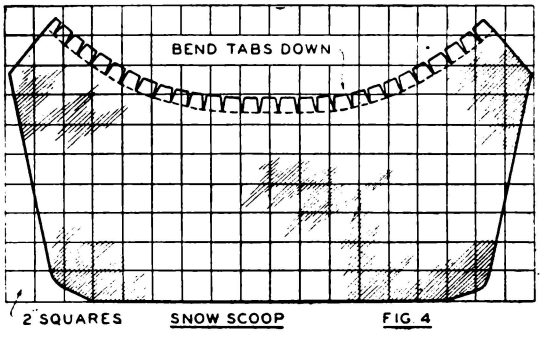
Side view of the shovel. Make sure that motor and electric cord are perfect.

Left—End view of the snow shovel which will be found ideal for the small home owner.

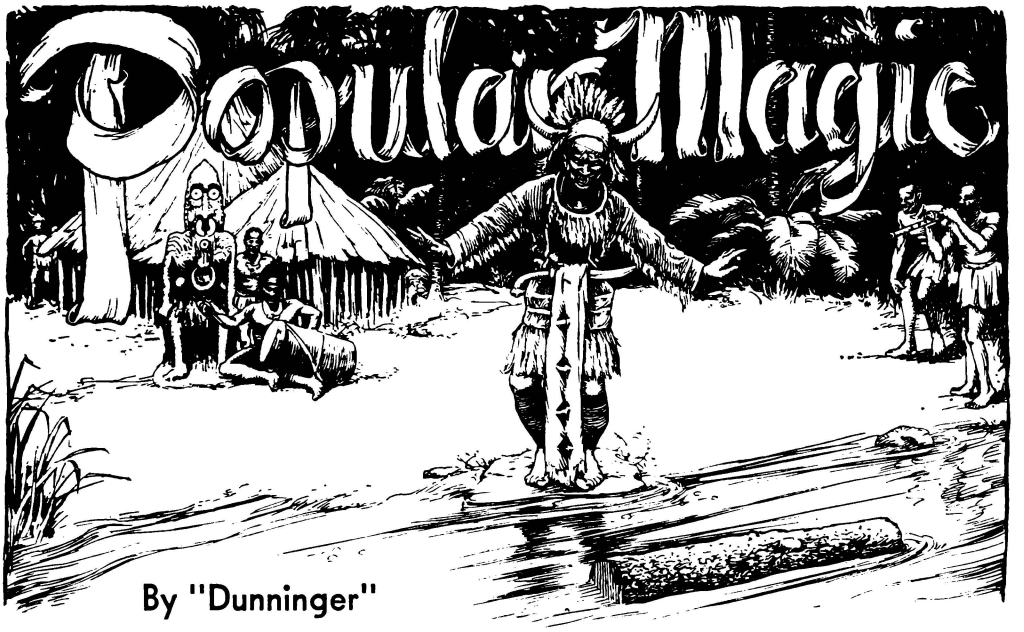




This perspective view outlines the simplicity of this construction. Note that the scoop has been reinforced.



Pattern for laying out the scoop. This will bend nicely and hold its shape.



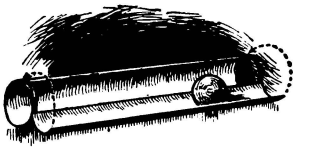
By "Dunninger"

NOTWITHSTANDING the fact that the jungles of Africa reek with superstition and magic, there are very few miracles that have ever been demonstrated to the white man to convince him of the genuineness of the jungle mysteries. Now and then, however, weird tales have been brought out of this dark interior; most of them exaggerated, but some based upon principles ancient to conjuring. One which seems to have been more impressive than the rest, because it earned for itself the right to be mentioned in various travel books of recent date, is called the "Mesmerized Log."

This diagram shows how the log is stopped by the string. The trick is absurdly simple but effective nevertheless.

The witch doctor, with face painted in gruesome fashion, stands near the edge of a swiftly moving stream. After a series of shrill cries and shrieks, a log is tossed into the water. The log floats with the stream for several feet; another yell and the log is made to stand still, apparently hypnotized, in the surging waters.

Naturally the spectator is not aware that the cunning witch doctor had attached a long fiber string to the log; the free end of the string had been tied to a tree. The string is quite unnoticeable in the rough water. Sometimes, instead of tying the free end



BACK VIEW-AWAY FROM AUDIENCE

The cylinder is made as illustrated above. Although the white ball is apparently pushed into the tube, actually it rides on a track at the rear. When the cylinder is closed the white ball can be forced into any position.

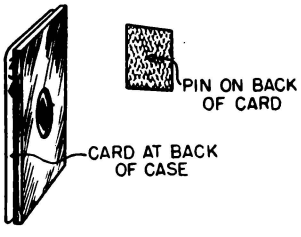
The manner of presentation of this trick is shown at the left.

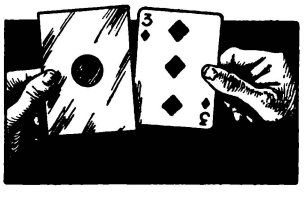
Joseph Dunninger, celebrated "mentalist" and magician, whose articles appear exclusively in this publication, is the world's foremost society entertainer, and has appeared before more celebrities than any of his contemporaries. Among those he has mystified are President Franklin D. Roosevelt, ex-Presidents William Howard Taft, Calvin Coolidge, Warren Harding, Herbert Hoover and Theodore Roosevelt, H. R. H. Duke of Windsor (formerly King Edward VIII), Thomas A. Edison, etc.

of the string to a tree, a longer cord is used; in this case the free end is held by a concealed native assistant. The native, in answer to the witch doctor's yells, makes the log travel up and down the stream in opposite directions by simply pulling the string or letting it out again, when desired.

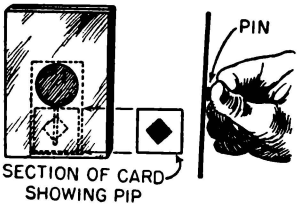
Ball Conjuring, a parlor-magic effect, operates as follows:

The magician displays a cylinder, about 14" long and 2½" in diameter, so that the audience can see through it. He now passes four billiard balls for inspection; one of these is painted white, the others are red. Holding the cylinder at arm's length, he rolls the balls into it in the following order: two reds, the white, and the remaining red ball. Much to the amazement of the spectators, the white ball is the first to make its reappearance from the opposite end of the tube, yet it was the third to be placed into the tube. The audience is invited to suggest the position the white ball is to occupy inside the tube and, regardless of whether it be second, third or fourth, it still makes its appearance first at the opposite end. The balls may be examined at any stage of the trick.





A card is apparently slid into a case having a hole drilled through it to show the middle pip. Actually it takes its position in back of the case.



The pip itself is a small section of card which is manipulated from the outside of the case as illustrated at the left.

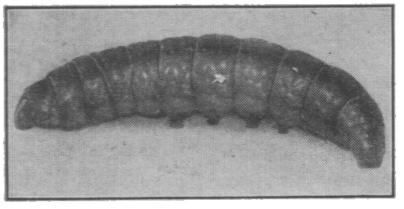
Explanation: The cylinder is made of metal, or it can be constructed easily from a section of cardboard mailing tube over which some fancy paper has been pasted. A long section of the tube has been cut out and hinged to the rest so that it can be made to fall away from the tube to produce a track upon which the white ball is made to travel. The ball rolls freely to and fro *in back of the tube,* rather than inside of it; thus it becomes possible for the magician to place the white ball in back of the tube upon this track, yet, at a distance of a few feet, make it seem that the ball actually enters the tube. The white ball can then be moved to any location desired. A short roll of the tube, toward the rear, closes the "door" and the arrangement is ready for the rest of the experiment.

In the past, many articles have appeared in the pages of MECHANICS AND HANDICRAFT, explaining tricks with cards of various sorts; some require the mysterious "disappearance" of a playing card, eventually to make a reappearance elsewhere. The usefulness of a piece of apparatus to enable the entertainer to effect the disappearance of a playing card, while the card apparently is held

(Continued on page 97)

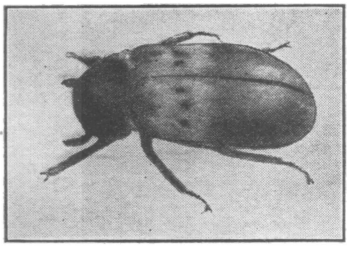
House Pests

No. 15—The Larder Beetle



The larva of the moth, Galleria melonella, demands beeswax for its food. Hence, it is often found in beehives.

By Dr. E. Bade

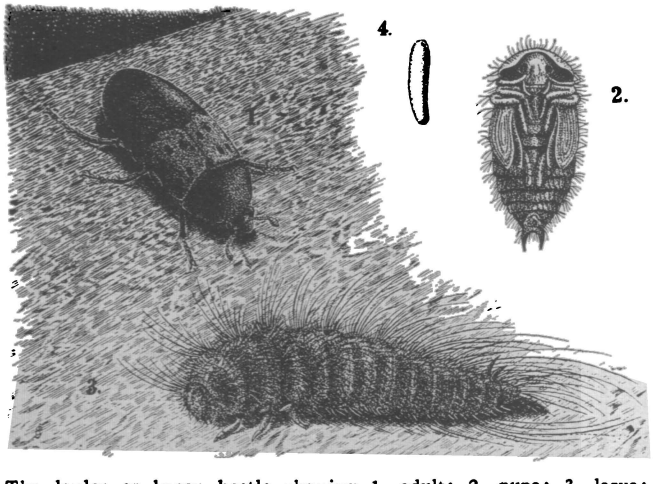


Right — The larder beetle, greatly enlarged. This insect is about 3/8" long.

THE majority of the insects depend upon a certain organic substance for their food, consequently there is a definite relation between the prevalence of insects and their food supply. In other words, most insects appear in definite cycles; however, there are exceptions; some insects are not restricted in their food requirements and these may be found at any time and in any season of the year; this is true not only for the adults, but also for the larvae. Some such insects are capable of feeding on and digesting a great variety of substances and it is these which often are the household pests.

In respect to food requirements there are quite a few insects which are peculiar in this habit. They have turned specialists; for instance, the moth *Galleria melonella,* which is frequently found in beehives. The larva of this creature demands beeswax for its food. Now wax is a substance which does not contain nitrogen and is therefore undigestible to other animals. To make up this deficiency in nitrogen, the larvae also feed on old pollen grains, old larval skins, etc., which are always present within the hives.

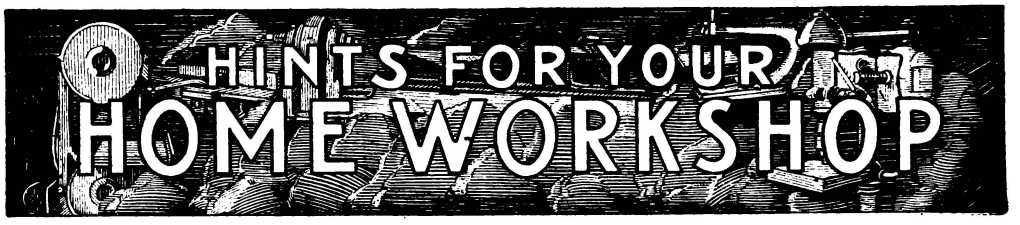
A different condition is met with by those insects and larvae which feed upon the fat of dead animals and carrion. The rancid odor produced by the fermentation of butyric acid attracts them. Among these food specialists probably the most important are the larder beetles belonging to the family *Dermestes.* Quite a number of comparatively tiny and inconspicuous beetles are brought under this head. When these creatures have once invaded man's dwelling they do considerable damage before they are noticed.

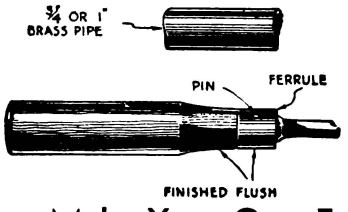


The larder or bacon beetle showing 1, adult; 2, pupa; 3, larva; 4, egg.

In appearance the larder beetles either have an elongated or oval body form. The largest member,

(*Continued on page 90*)





Make Your Own Ferrules

THE home shop worker sooner or later will be called upon to make handles for files, chisels, or possibly a skillet. However, no handle is complete without a good metal ferrule at the end, which strengthens the wood and prevents the handle from loosening. One can be made as follows: Brass pipe of about 1/16" wall from ⅝" to 1" in diameter is best. It is easily cut, looks well and inch lengths cost only about 2 or 3 cents each. Ordinary flexible steel conduit, costing only 5 cents a foot is also good. The handle is turned in the lathe to rough shape and the ferrule is started in place and then hammered home. The handle is replaced in the lathe and with file and chisels, the ferrule is brought flush with the wood. A small pin locks the tool in place.—V. H.

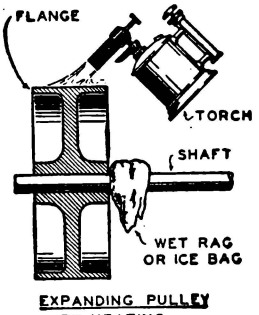
Anti-splash for Drain

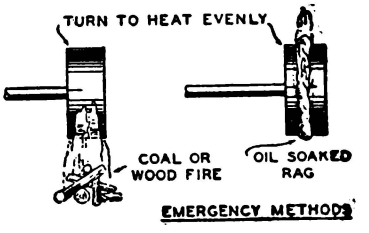
AN old bucket, with the entire bottom removed and placed over the drain, as shown, will prevent shoes and clothing from being splashed when the spigot is turned on.—J. J. GUDONIS.

Removing Tight Pulleys from a Shaft

TO LOOSEN a pulley or coupling from a shaft, one of the best methods is to apply heat (from a gasoline torch) to the rim of the pulley and ice to the shaft (a rag, wet with cold water, will do if no ice is available). By this method the pulley will expand and will be released when pressure is applied along the axis of the shaft or when sharp blows are struck on the hub to force the pulley off.

Kerosene will be found useful to cut any rust which might be present. Sometimes, reversing the procedure will make effective the step given in the first paragraph. Heating the shaft compresses rust and dirt; then cool and complete as outlined.—S.





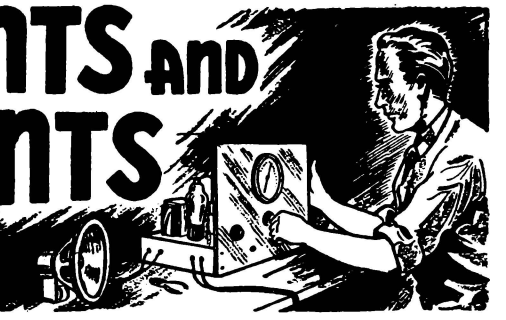
BAND SAW TABLE
BAND SAW BLADE
CUT THROUGH FINISHED WORK AT ANGLE
THIS IS THE CUT
SCRAP OF WOOD TO PROTECT FINISH OF ROUND PIECE

Band-sawing Finished Work

HAVING a number of small display stands to make recently for local stores, the writer used the following method to prevent marring the lacquered surface of the turned upright.

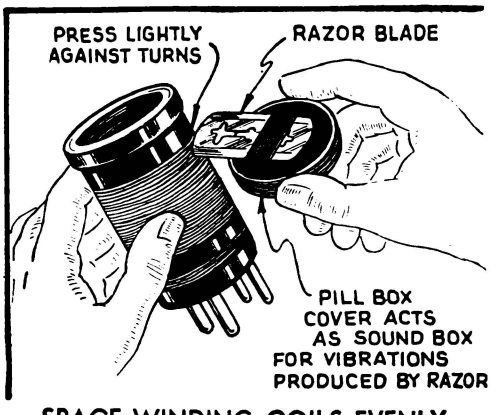
The band-saw table is roughened purposely, but when a nicely lacquered surface is pushed across it, the finish is damaged. If, however, the work is laid on a piece of thin scrap wood, and the two in unison are moved under the saw blade, the finish on the lower side is not only protected, but the usual feather edge doesn't result. The angle cut mentioned was necessary to produce a slanting top.—D. R. V. H.

RADIO HINTS AND EXPERIMENTS



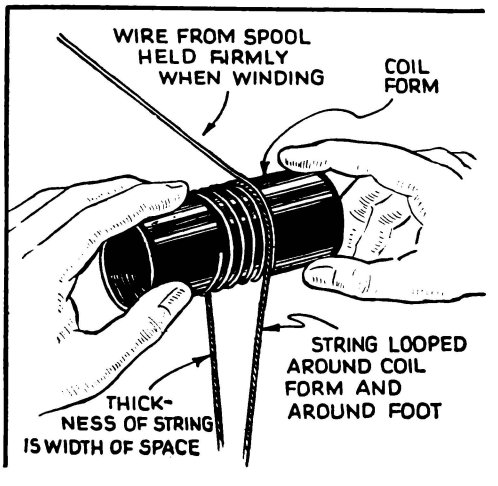
COUNTING THE TURNS

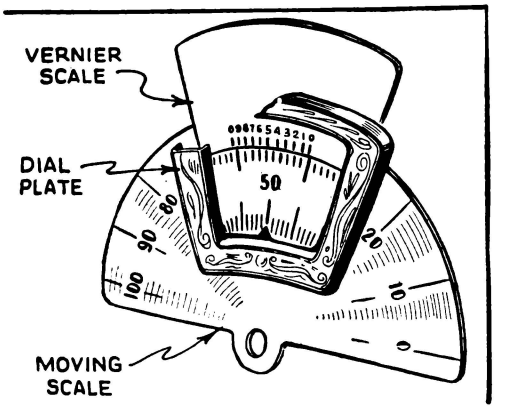
Counting the turns when winding tuning coils for short-wave and broadcast receivers, is often the hardest part of the job. This task is greatly simplified if a safety razor blade is "clicked" down the turns. The blade catches at each turn, permitting the turns to be counted quite easily. A pill box makes the sound of the clicks much louder if used as shown in the sketch.



SPACE WINDING COILS EVENLY

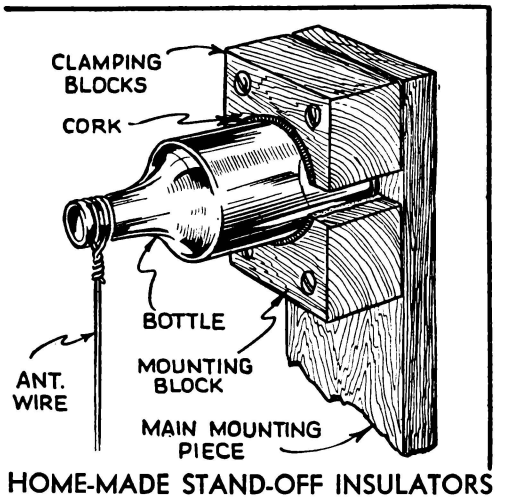
If you have ever tried to space out the turns of a short-wave tuning coil, even using a string or thread between the turns, you can appreciate the difficulty of doing a good job. If a loop of wire or string of the correct diameter for the spacing is slipped over the coil and under your foot, you do not have to fumble with the extra wire or string and the coil will turn out much neater.


WIRE FROM SPOOL HELD FIRMLY WHEN WINDING
COIL FORM
STRING LOOPED AROUND COIL FORM AND AROUND FOOT
THICKNESS OF STRING IS WIDTH OF SPACE



LOGGING STATIONS ON A SHORT-WAVE SET

After an elusive short-wave station has been tuned in, even if the location on the dial is noted, it is sometimes difficult to find the station again since the dial markings on most dials are not divided finely enough to permit accurate recording of the dial position. A vernier scale, operating on the principle of the micrometer scale, can be easily made and inserted as shown in the sketch above.



HOME-MADE STAND-OFF INSULATORS

Old glass bottles make fine insulators for supporting the aerial and the lead-in wire running to the radio receiver. These insulators are not affected by moisture or rain and are quite durable. The block of wood is drilled to the size of the bottle and then cut in half.

The Maker of Sleep

(*Continued from page* 28)

doctor) of a neighboring tribe, who was very angry with her for letting me, a white man, in on the secrets of Zulu witchcraft. How he found out about it she could not tell me, but my presence in the kraal was soon no secret and, no doubt, my interest in the arts of black magic had been reported to him by spies—almost everyone is a spy.

Dressed up, the Isangoma, looked awe-inspiring. On more than one occasion this priestess of Africa's dark and mysterious powers told me that unless she painted her face white, adorned her hair with gall bladders of goats, protected her body with strips of jackal skin and hung around her neck all those small amulets and bottles filled with "strong medicine," the bad spirits would get her.

She told me that if ever I was made a witch-doctor, I would have to paint my face white and dress up like this, too. Then she added that it would be very dangerous for the other white medicine man to go about without paint on his face. The spirits would certainly get him.

I pricked my ears. "What other medicine man?"

"The other medicine man, far away in the mountains, *the one who puts people to sleep,*" she replied.

"A white man who puts people to sleep? What are you talking about?"

She looked at me with a curious mien on her wrinkled face and, after a few seconds of hesitancy, she came out with it. "Many miles from here," she said, "there is a white medicine man and he has the power to heal or to kill. By his word, all *living* things go to sleep, people, birds and cattle."

It was hard for me to suppress my excitement. Did she know the white man? "Yes," she replied, "I know where he lives." But she was afraid to meet him, as he might put her to sleep, too. His medicine was stronger than hers. "He might even kill me," she retorted.

"Where does he live?"

She pointed in a general direction across a valley toward two mountain tops that spread their majesty against a jet-blue sky in a far off distance.

"Did she know anyone who could take me there?"

"No," she said. "No one would dare to take you into the white man's territory. It is too dangerous an undertaking. The White Medicine Man is a powerful man; he can kill with one word."

Her description added to my curiosity. Then and there, I made up my mind to believe her. No doubt such a man actually existed. The men of the kraal corroborated this information. One old man told me how, on one occasion, he had actually witnessed this mysterious White Medicine Man put all the people of a far off kraal to sleep, en masse. Frightened by the unusual scene he had witnessed, he "escaped" between two large boulders and fled from the scene, to escape a certain death, he assured me. Since then he had always been regarded as a hero by the rest of his own tribe.

Leaving my car at Nkandhla, I saddled my horse and rode away. My friend, the lady witch-doctor, predicted my untimely demise. She repeatedly warned me against going into the mountains of Qudeni, where the mysterious white man was said to live. She was convinced that the White Medicine Man would put me to sleep and probably get rid of me by killing me with his powerful magic. But all the king's horses could not have held me back.

Nkandhla is located about 6,000 feet above the sea level and the drop into the Qudeni Valley is about 3,000 feet, with the mountain sides rising almost perpendicularly on both sides. There is only a narrow zig-zag road leading down to the bottom of the valley, and on the mountain sides are perched perilously several large Zulu kraals.

Towards nightfall I arrived at a point from where I could see, on a hill-top, a small church, one of the many erected by zealous missionaries all over Zululand. In the meantime heavy black clouds had been gathering in the east, and occasionally a distant lightning flash illuminated the whole horizon. In an hour or so the storm broke. There was no other visible shelter besides this church and the kraals. I preferred the church. There was a man, a native, inside. He was praying, from fear rather than belief. When he saw me he turned to me and, in fairly good English, explained that he was a Christian Zulu who once worked in the gold fields of Johannesburg and also as a houseboy with a European family in Pretoria; hence his knowledge of English.

By this time the storm was at its height outside. We started talking with the old man in earnest. He was a man around sixty, with a beard and large colored wooden plugs in his ears. Like all Zulus, he wore very little clothes; the upper part of his body was naked.

On questioning him, he said that he was born in the Qudeni Valley and consequently knew the place and the people well.

"What do you know about the White Medicine Man who puts Zulus to sleep?" I asked bluntly. He was visibly shocked—and stared hard at me for a while. Then he began to deny that such a man was in existence. Finally, he wanted to know who had told me about the White Medicine Man with those strange powers. I admitted that Zulus from another district told me all about him. At last I became insistent, but my new Zulu acquaintance insisted upon keeping silent regarding this mysterious white man. He said that, being a Christian, he did not want to meddle in magic and other sinful things. I promised to pay him generously if he took me to the man. This he could not do; at least not without his "chief's" permission. Meanwhile he would guide me to a farmhouse where I could await him. After the storm abated he took me to a farmhouse owned by an Englishman, a certain Mr. Sutton, whose family saw to it that I was made comfortable. Naturally, the conversation often turned towards my mysterious mission in the remote parts of the wildest Zululand. They, too, had heard a rumor of a white man

"performing silly tricks," but they had never paid any serious attention to it. To them, as to most of the white people in Africa, these natives were only another gang of incurable liars and superstitious hopheads. But I was not convinced.

Early in the morning of the third day, Sunday, my black friend from the church arrived and said that the chief had heard from a native of Nkandhla that I was "a good man" and that I could be taken to see the Great Sleepmaker put Zulus to sleep, but I had to be careful not to let him see me or otherwise induce the man's wrath. Dire things would probably happen to those who betrayed him by taking another white man to witness the performance. I was all agog for rushing off, but my guide was not yet ready to go. First he wanted to know how much I was to pay him for his dangerous mission. I told him he would get a pound. This was satisfactory to him and the bargain was struck. At last, I was off upon this most amazing quest.

The trail zig-zagged up and down the mountain slopes until, after an hour's ride, we came to a plateau, where we dismounted. Leading our horses, we cautiously walked into a patch of dense bush, where we tied our mounts. Creeping on all fours, like hunters stalking a dangerous game, at last we came to a few fig trees. Here we paused for a while. Suddenly, a strange thudding sound reached my ears; it sounded as if someone was jumping up and down. My black friend now pushed aside a few leafy branches—what I saw completely took me off my feet.

There, in front of us, three young Zulus, waving their knob-kerries, were bouncing up and down ceaselessly like mechanical dolls. Never a sound escaped them. But their eyes were closed; they did not know what they were doing. They were in a trance and deeply affected by a mysterious power that had ordered them to perform this weird dance.

They acted as though they were obeying an unseen and mysterious power (reminding me of the scenes at a meeting of Holy Rollers in the United States). The weird dance gripped me with a cold fear and I became speechless for a long time.

A little further away I saw several prostrated bodies. At a first glance it was impossible to say whether they were alive or dead; so motionless were they that they seemed struck by lightning. It truly was a nightmare!

In the meantime the three dancers continued their horrible performance, like three sinners condemned to dance forever. At last, with a superhuman effort, I succeeded in shaking off the spell which this fearsome spectacle had cast upon me. Cautiously I opened my camera and, creeping as close to the dancers as I dared, I took a snapshot of them. Then I crept past them and the prostrated bodies.

Still further away, I saw several boulders. Grouped about them was a large group of native men, women and children. Some of the women were dressed in shabby European clothes. They must have come directly from the Sunday sermon at the little church on the mountain top, where a few days ago I had found shelter from the storm. The men, however, were dressed in full war regalia; they wore large bunches of feathers on their heads, they carried huge ox-hide shields, assegais and knob-kerries, while strings of gaudy beads adorned their bodies, arms and legs. Other women wore the traditional red-brown Zulu mantle flung across their shoulders. Their hair was done up in a cylindrical fashion a foot high—a mark of the married women; their necks and arms were covered with jewelry of beads and brass wire.

Suddenly, one of the three dancers, whom we by now had left behind us, dropped to the ground, exhausted, and lay as still as a rock.

During the entire scene not a single word was uttered by anyone. At last the silence was broken for the first time, when I heard someone shout, "Woga, Woga!"—"Wake up, Wake up!" The two remaining dancers stopped at once and sank to the ground as though they were hit by a shell, where they lay still for several minutes; then all three picked themselves up and joined the rest of the crowd, none the worse for their strange experience.

A short, elderly white man stood on the largest boulder and spoke in Zulu to the assembled natives. His voice was soft, melodious, but nevertheless far-reaching, because, from my vantage point, I could hear every word he said. Unfortunately, I did not understand him, but his strange, pagan audience listened attentively. He was a man about 60; his hair was still dark; he was dressed in European clothes, and, judging by them, he could have been a trader, farmer, or a missionary. When he raised his voice and spoke, he did not gesticulate, nor use any of the tricks of the experienced orator or showman. Whispering to my black friend, I asked what he was saying. He answered that the maker of sleep was soon going to put them to sleep and after they awoke they would be like new men, rested, free of their ailments, worries, and would be very happy.

Suddenly he paused in the middle of his speech. For the first time he raised his voice a trifle. His right arm outstretched, he stood motionless for a few seconds and then he uttered a short but brisk command. The effect was dramatic and telling. His listeners, like soldiers on a battlefield, drooped to the ground, some of them assuming queer positions, and began to fall asleep. A few children lingered. It seemed that his command wasn't of any special interest to them. They behaved like children at a prayer meeting, refusing to close their eyes. Later they, too, went to sleep, imitating their parents. I could not have believed this to be possible had I not witnessed it with my own eyes. Here was the famed "White Medicine Man" putting the whole native population of a Zulu kraal to sleep, en masse, using nothing but the old trick of hypnotism. Naturally, my chief anxiety was to photograph the entire scene. Without the photographs the story would not be worth the paper it was written on. I must get those pictures at any cost, I said to myself—and I stepped out of my hiding place and slowly but cautiously advanced toward the "Great White Magician."

The white man stood still. When he saw me, he slowly turned toward me. Again speaking to his sleeping "congregation," he repeated over and over the words—"Ni Ma Ku La," which, as I found out later, meant—"you are now sleeping, you are now sleeping." I braced myself up and stopped a few paces from him, waiting for a signal for me to advance or retreat. He gave me a calm look; without even a sign of surprise on his part, he motioned to me to come closer and not to hesitate. All around him lay the prostrated figures, fast asleep.

"Why have you come?" he asked me in pure English.

"I have been looking for you for many days, sir," I replied.

"I was aware of your presence in these localities," he nodded. "I had been told by the Isanusi, the witch-doctors." Then he added, with a friendly smile, "The witch-doctors wanted me to kill you. Now that you have found me, what do you want me to do for you?"

I told him that first of all I wanted to photograph the scene, if that were permissible. Next I wanted an interview. He said, "All right, go ahead and photograph all you wish, and feel assured that they will not wake up until I say so. Like a hungry news photographer, I ran among the hypnotised and prostrated bodies, shooting snap after snap, so as to be sure I would not miss a thing.

"There is no earthly reason to hurry," I heard that calm voice say to me. "They will sleep as long as I wish them to. If you care, you may try to arouse them yourself," he said, "but you will find that they are dead to the world."

When I was through taking pictures, I attempted to arouse a few of them to satisfy my curiosity, without avail. I even tried to shout in their ears. But nothing could disturb them from their deep slumber. Although I had often seen the so-called "living dead" in Lama Temple of Peking, this was the weirdest experience I ever had.

After I had my fill of pictures, the little man turned to his sleeping "flock" and uttered several times the word, "Woga," meaning "Wake up." One after the other they sat up, some yawning and stretching as though they were shaking off a deep night's sleep.

During a later interview, I asked, "I want you to tell me who you are. What reason do you have to put these people to sleep? Why do you force them to dance until they collapse? Back among civilization, many have heard of your superhuman power over these natives. I have come to report if you are a living being or a legend. You won't mind telling me the truth?"

He looked at me as a father would look upon his inquisitive son and smiled softly. "Those three men whom you saw dancing were once mortal enemies. I made them dance the dance of 'friendship.' When they came out of their trance, they were cured of the feud and had forgoten their troubles, and you can rest assured that they will remain friends as long as I want them to be."

I was dumbfounded for a while. I figured that there was a logic in his work. But he continued.

"I tell these people that most of their ailments are caused by fear, a sort of sub-conscious fear, you know. If one can kill that fear, there is nothing the matter with the body; the body is the slave of fear. Once fear is gone, the body becomes free. It took me a long time to make them understand this logic," he continued. "Now they have been cured. In fact, I have made lame walk, deaf hear; I have cured their headaches and most of their simple pains have disappeared by simply telling them there was no such thing as pain. Their strong belief in me has made them free of many troubles."

"But, sir, who are you?" I insisted.

By this time a black Zulu brought him his pony.

"That is of no importance," he replied. "However, I may mention that I am only a storekeeper from beyond that mountain. Furthermore, I am not a witch-doctor, although these people believe me to be one. They say that I can kill people by ordering them to lie down and die. I can assure you that I have never made any attempt to do so, although I believe that I could. But, thank God, I believe in these people and they believe in me. They are my best friends and I am their best friend."

He mounted his pony and, with a broad smile, waved goodbye and rode away.

This deepened my curiosity, and I tried to learn the identity of this unusual man.

After the photos were printed, I sent a few copies to an official at Nkandhla, asking him if he could tell me about the Mysterious White Man. This is the answer I received:

"Nkandhla, Zululand, January 6th, 1937.

"I know the man well. He is a storekeeper in Qudeni. Twelve years ago he obtained a book on psychology and since then has interested himself in hypnotism, but I never imagined that he would be such a past master in the art of 'mass hypnotism.' . . . His name is Peter Titlestad."

Historic Inventions

(*Continued from page* 31)

that the models were sent to the General Supply Committee for disposition as surplus property.

Dr. Frederick L. Lewton, Curator of Textiles at the National Museum, was a member of a committee of three which made the selections for the National Museum and carried out the dispersal of the models. He explains now that the selections, while all possible care was used to get the most valuable and most important models, were of necessity of a somewhat sketchy nature, because of the manner in which the models were stored. A patent Number 10,000 might be stored alongside Number 100,000. They had been stored with regard to space requirements rather than any orderly arrangement.

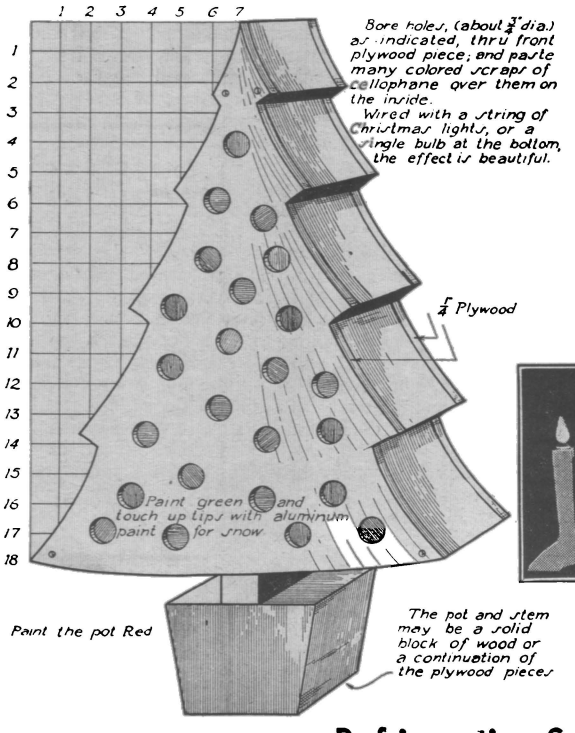
This confusion may be understood when it is known that in 1912 the models were stored in the tunnel leading from the House Office

(*Continued on page* 93)

Novel Decorations for Christmas

(*Continued from page* 55)

proper locations. All of the windows in the front of the writer's house at Christmas last year were decorated with the plywood candles, with striking effect, and at a fraction of the cost of similar articles found on sale in the stores; the sawed-out trees graced both ends of the living room mantle. The star, illustrated, shone from the top of the tree.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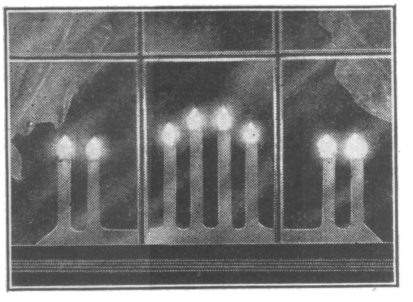
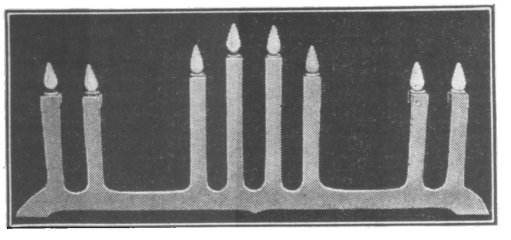
Bore holes, (about ¾" dia.) as indicated, thru front plywood piece; and paste many colored scraps of cellophane over them on the inside. Wired with a string of Christmas lights, or a single bulb at the bottom, the effect is beautiful.
¼" Plywood
Paint green and touch up tips with aluminum paint for snow
Paint the pot Red
The pot and stem may be a solid block of wood or a continuation of the plywood pieces



From the outside this is the effect obtained with the window candles.



The finished candles which are to be used as a window decoration look like this from the front.

Refrigeration Servicing

(*Continued from page* 57)

latter valve is generally nothing more than a strip of thin steel seating over an opening in the discharge plate.

Thus, low pressure vapor has been sucked into the compressor, pressure has been imposed upon it and then this high pressure vapor is pushed over into the condenser. Fig. 2 shows the cross-section of a typical compressor.

It will be observed that the compressor is a mechanical pump, having rotating and sliding parts. These must be lubricated. A certain amount of oil slips by the piston and circulates with the refrigerant. The returning or suction vapor is therefore led to the crankcase of the compressor, so it can drop its entrained oil. Thus, while a small quantity of oil is leaving the compressor, a like amount is returning, keeping a proper oil level in the compressor crankcase.

The compressor is the dividing line between the high pressure vapor and the low pressure vapor, or, as it is known in the field, divides the "high side" from the "low side."

The condenser has for its function the removal of heat from the high pressure vapor and the cooling of the high pressure liquid. Some condensers are cooled by having cold water flowing over or through them. This is the way large condensers are cooled. Small condensers, such as are found on household machines, are cooled by a draft of air blown over them by fans mounted on the motor shaft.

Condensers may be made of plain copper tubing or in order to reduce their size may have fins or extended surfaces attached to the tube to dissipate the heat. Fig. 2A shows a number of different condenser types.

When a vapor is compressed the operation literally squeezes out heat. Thus, if a vapor be compressed the latent heat it contains begins to show up in an increase in the temperature of the vapor, so that if this hot gas be led to a condenser where a draft of air is blowing over it, heat will flow from the hot gas to the cooler air. Latent heat of condensation is given up and the vapor is converted to a liquid.

The refrigerant condensate, or liquid, is allowed to trickle through the lower portion of the condenser so that its temperature is brought down to just a few degrees above the cooling air which is blown over the condenser surface.

(*Continued on page* 76)

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AND OTHER MEN WITH IDEAS

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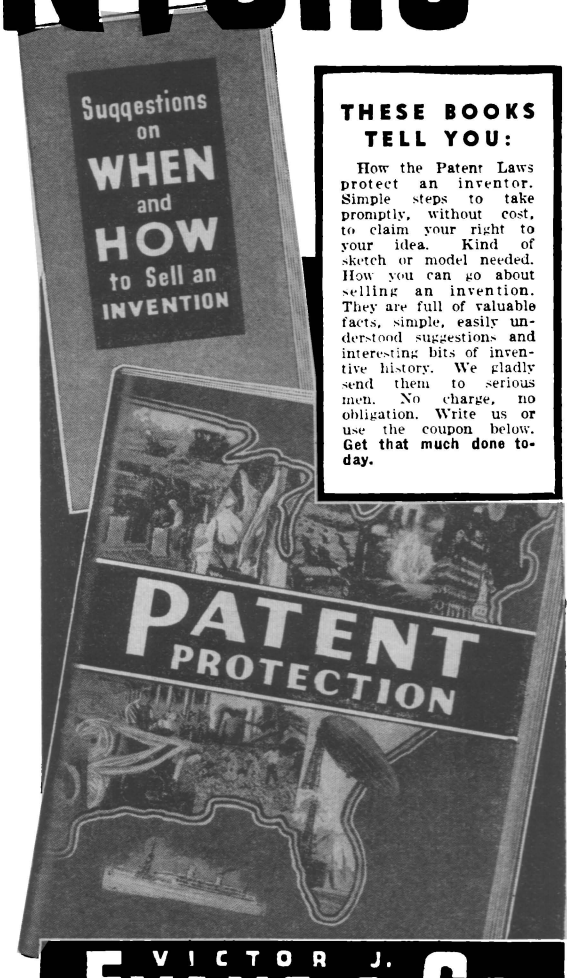

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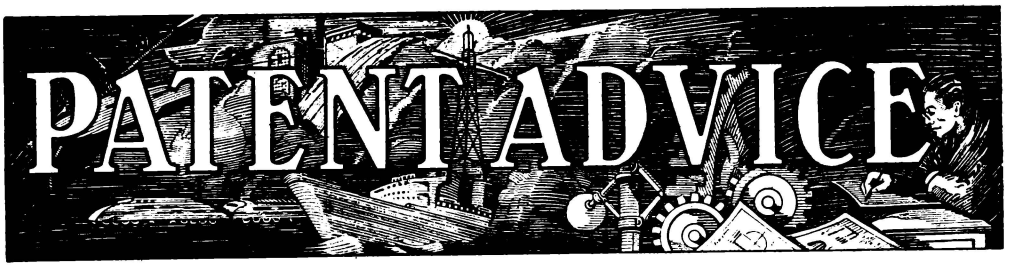

Conducted by Joseph H. Kraus

Since 1919 the Editor of this publication has given Patent Advice to many thousands of readers through the pages of several leading popular scientific magazines. Never has any question of honesty or integrity been raised. The Editor always writes what he believes to be the truth, without fear of what Mrs. Grundy may say or think.

In this department, which will be published monthly henceforth, only such matter as is of general interest to inventors will appear. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries will be published here for the benefit of all readers. However, if the idea is thought to be of importance, we make it a rule not to divulge all details in order to protect the inventor as far as it is possible to do so. In many cases where patenting procedure is recommended the letters will not find their way into these columns.

Should advice be desired by mail a nominal charge of $1.00 is made for each letter. Sketches and description must be clear and explicit, only one side of the sheet should be written on and inquiries should be sent folded, not rolled.

Before mailing your letters to this department, make sure your name and address appear on the letters, drawings, and envelope. Please address Patent Editor.

Pencil Sharpener

Henry J. Lundry, Thompsonville, Conn., asks, "What is the commercial possibility of a new pencil sharpener that will do a smoother job without breaking the lead, and would there be any advantage to have it power driven?"

Answer: It is unfair to ask us to comment upon an inquiry of this type. We are no more able to tell the commercial value of this item than we would be to suggest the market price of a cat in the bag. You may have devised a very elaborate pencil sharpener which will do what you claim for it, but which, because of its cost, or the necessity of constant repair, or slow operation and innumerable other factors, may never be looked upon favorably.

There is an advantage to motorizing a pencil sharpener and sharpeners of both the motorized and hand-driven forms are available on the market.

Typewriter Eraser

W. J. Sechrist, Borger, Texas, proposes to use finely ground iron or steel, mixed with rubber, for use as a typewriter eraser. A magnetized bar is then to catch the abrasive particles and prevent them from falling into the mechanism.

Answer: This would be quite an effective trick if the magnetized bar were powerful enough to gather up all particles of steel; but steel particles are not strongly attracted to a magnet and the smaller they are, the less is the attraction. Consequently, some of the pieces will fall into the mechanism of the typewriter, where they would do even greater damage than sand.

We do not believe that your proposal solves the problem.

Fly Sprayer

William S. Bauman, Ephrata, Penna., has designed a pressure fly sprayer into which the air is pumped and after which the sprayer can be used without manipulating the pump. He wants our opinion of the product.

Answer: If you will examine your drawing carefully you will find that your completed sprayer is identical with a gasoline blow-torch or those garden sprayers which may be purchased in any horticultural supply shop. We doubt that such a sprayer is as effective as a modern hand-pump type which, because of the greater quantity of air, divides the solution into mist-like particles.

Also, your sprayer would be much more expensive to manufacture. We would not advise further procedure.

Patent Search

Howard Henry, Toledo, Ohio, asks about patent searches and how much they cost.

Answer: Any patent attorney can do this work for you. The cost of the average search is not more than $10.00.

Inventor's Models

M. Schulman, Brooklyn, New York, asks if we deem it advisable for him to entrust the making of a model to anyone specializing in this sort of work.

Answer: If you have cause to doubt the integrity of a model maker, it is advisable not to give him any work. However, if you mistrust outsiders just on general principles, then it is recommended that you divide the model up so that one model maker makes one part and another makes the second. Then, you can do your own assembling. If the model calls for a one-piece construction, would suggest that you take it to a man whom you believe honest. You can have him sign and date your drawings, establishing for you a definite proof that the work was done in accordance with plans you submitted. The model maker has no way of knowing whether you have applied for a patent nor can he determine the commercial value of an article unless the product fits in with his particular line of business. We recommend that you go ahead and have the work done and don't worry about the possible consequences; it is not likely that there would be any.

Door Lock

John V. Dundas, Peterboro, Ontario, states that he has invented a door lock which does not need a key to operate it from the inside. The only time the key is used is when unlocking the door from the outside. He wants our advice.

Answer: Locks of this type are in common use. The average house door is provided with a mechanism which locks the door from the outside but which can be released so that the door is free to open from either side at will. The proper key will unlock the door from the outside, but only if the safety catch on the inside has not been thrown and, if the safety catch has been thrown, then even the key will not open the door. Before doing any further work on locks, would recommend that you look into existing types very thoroughly. There are thousands of them.

Replaceable House Door Numerals

Glenn Odermann, Croff, North Dakota, has submitted a design for house numerals which hook together. He requests our opinion.

(*Continued on page* 75)

PATENTS
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L. F. Randolph, 753 Victor Bldg., Washington, D. C.

Patent Advice

(*Continued from page 74*)

Answer: We do not believe that your design differs greatly from the suggestion given in the "What to Invent" pages of this publication nor do we hold that this is the answer to the problem. A better, more practical and certainly more artistic treatment of the problem is necessary.

Trousers Hanger

Philip L. Young, Bangor, Maine, submits a photoline print for a trousers hanger which he states he has forwarded to sixty odd manufacturers without results. He asks for our opinion of the same.

Answer: Had you gone to the trouble of making this simple wire trousers hanger and tried it out on several trousers, you would have found that the item is not as good as you believe it to be. Trousers with narrow cuffs require that the hanger be bent inward and when this is done the vertical wires do not hold. Instead, the trousers are supported at one point. When the hanger is used on trousers with wide cuffs, it will have to be expanded. Furthermore, a round wire does not give the sharp crease demanded. Another point, however, which you did not consider, is that a hanger of this type demands a lot of fussing before it can be entered into the cuffs. The clip type of hanger is much better and perhaps not much more expensive to manufacture. We are afraid that you are doomed to disappointment with this construction.

Tube Closure

Joseph Fairfield, Kenora, Ontario, recommends the use of a rubber fitting to go over the top of a tooth paste tube, said fitting to have a small slit in it so that when the tube is squeezed, pressure opens the slit, and when pressure is released, the slit closes. "A bit of tooth paste remains in the slit and seals it hermetically."

Answer: The item which you recommend is very similar to the rubber fitting found on tubes and bottles of mucilage. Here, however, the slit is opened by pressure applied to the tab. After such a job is in use, the slit portion becomes unsightly. Furthermore, paste that remains on the outside of the tube collects dirt and dust. We are extremely doubtful that your suggestion is patentable, but if you want to assure yourself on this point, a patent search would be advisable. We would not recommend further action.

Photo Cell Use

A. J. Tazelaar, Macatawa, Michigan, asks if a patent can be taken out on a new use for a photo cell or a device using a photo cell.

Answer: Unless we have further information, it would be very difficult to advise if such procedure is to be recommended. However, there are many new uses to which a photo-electric cell could be put and which are patentable.

Comb—New Type of Cork

Lester Paganuzzi, New York, N. Y., submits a plan for a comb with a liquid container integral with same and holes between the teeth through which the liquid is to exude. He also furnishes a design for a cork to eliminate cork screws. He asks our opinion of both.

Answer: The comb idea is very old and we do not believe that your product is even as good as other items which have been manufactured for the same purpose. Although you state that with your comb the hair tonic will be applied close to the scalp, an examination will reveal that the liquid exudes at the back of the comb and therefore is as far away from the scalp as it could possibly be. There are combs (and brushes) with holes running through the teeth which actually apply the hair tonic at the base of the scalp. Some of these combs have heating coils to supply hot oil under pressure. Others have means and methods for distributing the proper amount of liquid directly to the scalp.

We do not consider your cork an improvement. It does not provide a perfect seal for the contents of the bottle nor does it afford a very good grip for the fingers. We also feel sure that if this product were to be used, some form of a gripping device would have to be arranged so that the metal piece could be grasped for extraction of the cork. We doubt very much that you can do anything with this idea.

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Refrigeration Servicing

(*Continued from page 72*)

In some cases condensers have a few more turns of tubing so that liquid is stored there; in most cases, a receiver is employed so that the cooled liquid, leaving the condenser, flows into the receiver. Under normal or regular operation, these receivers are ¼ to 1/3 full of liquid and are usually of sufficient size to hold all the refrigerant in the system. For this reason receivers must not be filled to greater capacity than 1/3, otherwise there would be no place for the refrigerant from the remainder of the system.

Receivers should contain a small amount of liquid as noted, so as to keep the liquid line full of liquid at all times. This is known as "liquid seal."

Receivers may be vertical or horizontal.

In most cases the manufacturer installs a liquid shut-off valve at the receiver. This valve may be on top, at the side or on bottom of the receiver. In the first two cases a tube extends from the valve to the bottom of the receiver so that liquid is forced through the valve and into the liquid line.

The throttle devices in common use are:

Automatic constant pressure expansion valve
Low side float valve
High side float valve
Capillary tube

While there are other throttling devices, data will be given covering only the more popular ones, that is, the automatic constant pressure expansion valve and the low side float valve.

The throttle device limits the quantity of liquid refrigerant allowed to enter the evaporator. It must function properly, for if too little or too much liquid is passed to the cooling coil (evaporator) the refrigeration apparatus will not function satisfactorily.

Just as the compressor served to divide the high from the low side, so the throttle device; thus, when the unit is in operation, two distinct pressure conditions exist. See Fig. 3 for this.

The evaporator or cooling coil is nothing more than a boiler; liquid refrigerant, entering it, finds a low pressure condition and it boils at low temperature. In other words, heat is taken up by the liquid and is utilized to effect a change from liquid to vapor. The heat, of course, is that which has been carried from the refrigerator walls, refrigerator interior and foodstuffs to the coil by convecting currents of air. Fig. 3A illustrates evaporators of two distinct types.

The evaporator may consist of a long piece of tubing bent to form a suitably shaped coil or it may consist of a body or vessel of large diameter, with a series of tubes brazed into it, usually at the under side.

The coil type is known as the "dry" variety, as it actually has but little liquid refrigerant in it, in contradistinction to the "flooded" type, in which the body and tubes contain considerable liquid refrigerant.

The suction line is the line which is connected to the evaporator, through which the vapor evolved in the evaporator through the absorption of heat is drawn back to the com-

pressor. This line is usually of ⅜" or ½" outside diameter copper tubing. In a few cases this line will be found to be ¼" or 5/16".

The liquid line connects the receiver with the throttle device. It is generally ¼" outside diameter copper tubing. It will be observed two lines lead to the refrigerator. The larger one is the suction and the tube of smaller diameter is the liquid line.

Interposed in the liquid line itself, or at the liquid shut-off valve or at the throttle device, there is (or should be for correct performance and freedom from trouble) a liquid strainer or filter. The purpose of this portion of the system is to remove any dirt, grit, oxide flakes or metallic particles from the liquid before it enters the throttle device. Fig. 6 illustrates a popular model.

The discharge line is sometimes merely an extension of the tube forming the condenser. It serves to convey the hot, compressed vapor discharged by the compressor to the condenser.

Most standard or conventional units have three service valves, viz: a liquid shut-off valve (LSOV) at the receiver, a discharge service shut-off valve (DSSOV) at the compressor, usually at the top, and a suction service shut-off valve (SSSOV), in many cases at the side of the compressor or in later models also at the top of the compressor. These valves are used only when the unit must be serviced. In normal operation these valves are left wide open.

An illustration of a liquid shut-off valve is shown in Fig. 4. This is the usual type employed. There are a few other types, but their operation is the same.

To close this valve the stem is run in all the way. To open it the stem is unscrewed or screwed out of the valve body.

Suction and discharge service shut-off valves are of identical construction, their position in the system giving them the name of either suction or discharge service shut-off valve. They are of the three port type, as shown in Fig. 5.

There are three openings in such valves, viz: the main end opening, usually with a flare thread, the main side opening, generally a two hole flat face flange and a service port opposite the main side opening. The latter is either ⅛" or ¼" pipe thread, usually the former.

By screwing the stem in all the way, or out all the way, the gas passing through these service valves can be sent in different directions.

For instance, if we consider the valve in Fig. 5 to be a discharge service shut-off valve (DSSOV) we would find this stem unscrewed all the way, or "backseated," as it is termed, allowing gas to enter the main side opening and leave at the main end opening.

A suction service valve would have gas entering the main end and leaving at the main side opening. See Fig. 3 to check these flows.

Now, if we wanted to secure gauge readings of the pressures existing in the system we would make use of the service ports on these valves.

First test the valve to make sure it is backseated. This is done by applying a square

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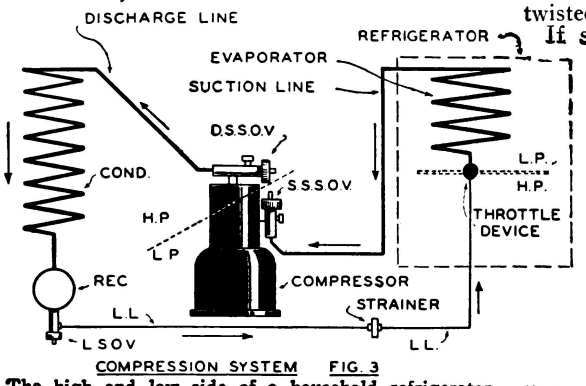
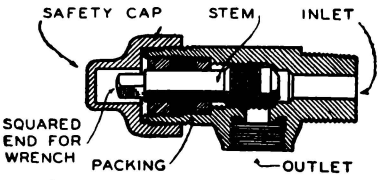
socket wrench, usually a tee handle valve wrench. Make sure pipe plug is in place. Then turn wrench so stem screws in. If it "jumps" off its seat, it will be known to have been on it be on its backseat. Most stems are ¼" in diameter and when a square is cut in this stock it does not leave much metal. Use care in testing the valve and the stem will not be twisted off.



COMPRESSION SYSTEM FIG. 3

The high and low side of a household refrigerator system is illustrated in this diagram

If stem seems tight, loosen packing nut a little and squirt a little refrigeration oil around the stem.



LIQUID SHUT-OFF VALVE FIG. 4

The liquid shut-off valve is a little more simple in construction than the discharge or suction service shut-off valve.

backseat. It can be returned to backseat. If the stem runs in smoothly (perhaps tightly, but smoothly) someone left the valve off backseat. It should be unscrewed until backseated.

Always follow this procedure. If a wrench is applied and the valve stem turned as though to unscrew it, the stem will be twisted off if

Part III, which will appear in the next issue, will involve data presented in the first two chapters. Therefore, make sure the functions, circuits, etc., are thoroughly understood, so that the preliminary service work can be entered upon. The valves are especially important and one should have the construction of these service devices firmly fixed in the mind.

Underground Fires

(*Continued from page* 41)

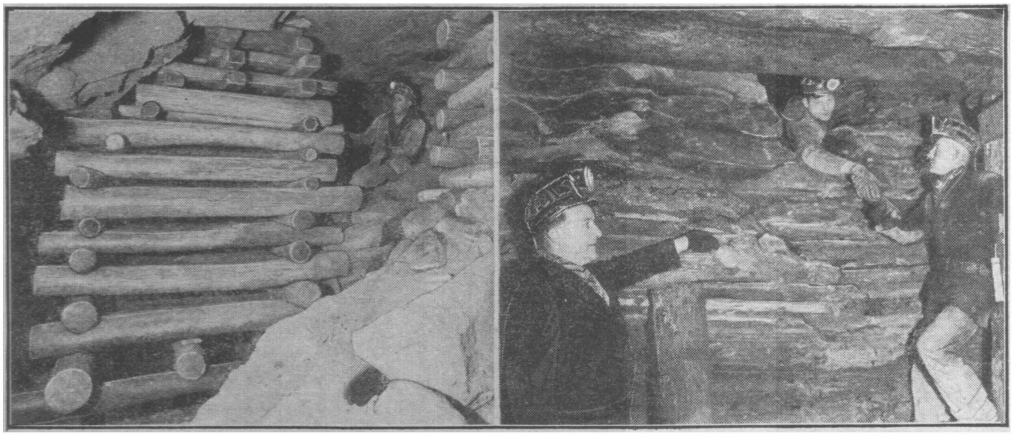
United States Bureau of Mines in drafting plans to isolate the fire, estimated it would take a year and a half to cork up the three "bottle necks" of the burning area.

If this is done effectively, he said, the fire's course will be halted. Otherwise it is conceivable, he added, that the flames would sweep on until eventually they reach almost to the Ohio River, nearly 150 miles south of New Straitsville.

Gargantuan trenches and tunnels sixteen feet wide and from eight to thirty or more feet deep are being dug out in this strange but highly scientific campaign to head off a seemingly unconquerable force of devastation.

Largest of the barriers is being built at Lost Run, south of the fire zone in Hocking County. Designed to protect the rich Hocking Valley fields, it will be more than a mile long.

Next largest, which will be 4,000 feet long, will extend across the northwestern corner of the fire area; while the third, 3,000 feet long, will be at Martin's Hollow, on the extreme western rim.



The "bootlegger's slide" in the Human Graveyard, where, during prohibition days, bootleggers entered to come up two miles away. Giant timbers support as much as 3,000 tons of rock 28 feet deep.

Two miners breaking through in Plummer Hill tunnels. At the start of the fight against underground fires, this tunnel, was known as the "Human Graveyard" and many miners were afraid to work in it.

Dramatic is the fight the engineers are making to push through the tunnel on Plummer Hill. It is a race against time, for already the heat can be felt 50 feet from where the diggers are working day and night.

"A million tons of coal in Plummer Hill can be saved if we can get through in time," said A. J. Laverty, General Superintendent in charge of operations, "but it will be a tight race and a dangerous one for us. We must have only experienced miners to work in the tunnels and these men must attend our safety school regularly." One of the serious problems of the fire fighters is the influx of visitors. Motorists are coming long distances to inspect this charred and barren no-man's-land, to watch the flames roar and the vapors spurt hissingly from glowing crater-like holes and to see the miners go gingerly about their dangerous work.

Because successive freezing and thawing have caused so many new fire holes to pop out in the most unexpected places, the engineers in charge have placed guards at some of the more treacherous places for the protection of the sight-seeing throngs.

David Rush and Williard Andrews still live with their families in two homes on Plummer Hill, almost within a stone's throw of the blazing area. They say they are used to the fire and do not believe there is any danger, but officials predict they will have to move out soon.

Reputedly started in the great coal strike of 1884 by miners, this 53-year-old fire has been spreading steadily. Many acres of woods and farm lands have been ruined, some homes hurriedly abandoned, paved highways have caved in and a church and a large school house have been imperiled.

In this weird sector, which looks so much like Flanders Field in the days of the great hate, one sees strange sights. Within a few yards of a fissure from which issue smoke and fumes, an oil or a gas well may be in operation; or miners may be placidly digging coal opposite a hillside abloom with blazing craters; or school children may be playing a few yards from a spot where a miniature geyser sends up its steaming fountain at regular intervals.

"It's just Ol' Faithful," the children laugh and go on playing. How the great fire started is more a matter of legend than of history.

The story usually told goes like this:

Ohio miners went on strike in 1884, precipitating one of the bitterest labor conflicts in history. The first units of the miners' union were organized in Ohio that year.

After the strike had been in progress some six months, a group of men one night seized a number of loaded mine cars on a tipple at New Straitsville, poured oil on them, set them afire and sent them down five different shafts a mile or so underground. Within a week the fire had passed all possibility of control.

As the years passed, the fire continued to eat its way into new territory, burning into solid seams of coal as its fumes opened fissures to the surface above.

No one knows when or where the fire will break through. One day last summer a dweller

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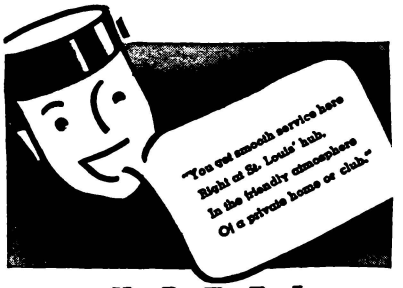

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Like the dwellers on the slopes of Mount Vesuvius, the residents of Ohio's inferno-land think little of the perils about them.

While visitors to the "Firelands" are prone to express astonishment and uneasiness, the folk in that region joke about the subterranean conflagration, which many of them appear to regard as just a spectacle—and one worth going far to see.

About a year ago pupils of New Straitsville's $80,000 High School complained of the heat, even though the furnace was out. This led to the discovery that the underground fire was within 25 feet of the structure. An emergency crew dug through the basement and around the foundation, removing the smoldering coal, and saved the building.

One of the strangest things about the New Straitsville fire, as it has been known since it first started, is that none of the men who allegedly caused this wanton destruction ever were arrested.

Mine owners offered tempting rewards to learn the names of the guilty persons. Detectives worked on the case for years. Yet nearly everyone in this region conceded that it would be impossible to obtain a jury that would convict.

The nearest the mystery ever came to being solved, according to a story one often hears in the mine fire country, was about a year after the outbreak of the flames.

A former Ohio Penitentiary inmate, returning to the scene of his boyhood, was working in a mine near New Straitsville. Leaving the mine one day, he was walking on a street in the village when a constable approached to arrest him for a misdemeanor. He drew a pistol and began firing, killing not only the officer, but also a boy who was coming from a school building across the street. Soon afterwards he was captured.

A mob that night broke into the jail, dragged him out and hustled him to a nearby tree. With the noose around his neck, the killer conceived a plan for revenge. He would shout out the names of the men who started the mine fire, hoping that someone in the crowd would repeat the names to the proper authorities.

"I know who ran those burning coal cars into the mine and I am going to tell you their names," he suddenly shouted at the top of his voice. "The men were"—that was as far as he got. A dozen or more frantic hands tugged at the rope and the tightening noose shut off his voice forever.

Three years ago the fire reached the outskirts of New Straitsville, undermining a dozen dwellings, which had to be abandoned. Progressing steadily, the underground menace now is close to the town's main street.

Hundreds of efforts have been made to ex-

tinguish the fire. Fortunes have been spent to that end.

In one of the most thoroughgoing of previous attempts, cement walls were sunk at what were thought to be strategic points. But the intense heat cracked the cement and the fire passed on through as if no obstacle had been encountered.

In another attempt, the course of a creek was diverted and the water sent down a shaft into the seething cavern, but gases that resulted only seemed to spread the fire more rapidly than ever.

Explaining more in detail the plan now being pursued to conquer the blaze, Dr. Carl Watson, Ohio's Works Progress Administrator, declared, "Our job is to cut the three veins of coal that lead to other fields and to barricade the fire by filling the incisions with clean mud. In doing this, we are following the plans and recommendations laid down by the United States Bureau of Mines." Dr. Watson thought that the fire, if isolated at the barriers now set, would burn itself out in 150 to 200 years.

An interesting phase of the mine fire fighters is the elaborate precautions taken to prevent accidents and to properly furnish equipped and efficient rescue crews, should they be required.

At New Straitsville, a Mine Aid Rescue Training Station has been set up, where enough equipment is kept to supply two rescue crews of five men each. The equipment includes self-contained oxygen breathing apparatus, battery type electric lamps, safety boots and shoes, caps with lamps, miners' first-aid kits, gas-testing apparatus, canister-type stretchers and many other articles needed in rescue work.

New Giant of the Air

(*Continued from page* 35)

fortress," these new ships will be the largest landplanes ever built in this country. Powered with four Wright G-100 Cyclones of 1220 horsepower each, the new ships will have a speed in the neighborhood of 230 miles an hour. The spacious cabins will seat 32 persons by day, in addition to the crew of three; and by night, sleeping berths will be provided for 18 and additional seats for 8. 3,750 lbs. of cargo and mail will be carried in addition to the passengers and their luggage; the gross weight of the ship will be 42,000 lbs.—21 tons!

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Brain Waves

(*Continued from page* 29)

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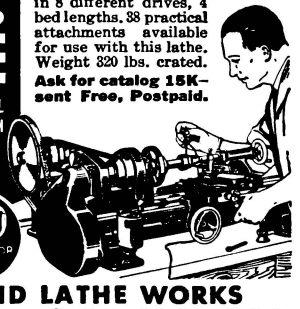

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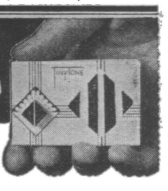

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subject. One authority, Dr. George Kreezer, of Vineland, N. J., has made some very interesting studies of brain wave records from mentally deficient persons.

Another expert, Dr. J. Roy Smith of Columbia University, has made a special study of brain waves (known as electroencephalograms) of subjects during infancy and up through various stages of childhood. In one group were 58 normal children, ranging in age from 1 day to 17 years. In some of these tests, waves with a frequency of 4 to 5 per second were recorded with infants, even as early as the *first day after birth!* A few days after birth, rhythmic waves of 8 per second, or more, have been noted.

One radical new discovery seems to be that the new born child has a more active brain than medical experts have believed heretofore. It is thought that if the electrodes of the recording apparatus could be attached to the head of a human embryo that brain waves would be recorded. This would show that to some extent the brain functioned even before "life" actually started. Inasmuch as brain waves have been recorded by Dr. Smith, of Columbia University on the first day after birth, it would seem illogical indeed to think that the brain only started to function the day after the child was born. In Dr. Kreezer's work appears another valuable avenue of research; it seems that we shall be able to make scientific analyses from charts for each mental patient in our large sanitariums. "Brain wave" diagnostic methods may prove valuable in the early analyses of suspected cases of mental deficiency.

Another expert, Prof. Hallowell Davis, of Harvard University, has noted that there are several distinct types of these electric brain waves, each noticeably individual and characteristic for a certain type of person. The most prominent electrical brain wave rhythm has been labelled the *alpha rhythm,* in which the waves occur at the rate of 10 per second. The electrical potential of these alpha waves varies from 50 to 75 micro-volts. There is a faster wave known as the beta rhythm which has a lower voltage or potential. According to Dr. Davis, passive, patient, receptive individuals show strong alpha waves, and plenty of them, on the recording apparatus. On the other hand, these waves are weak and few in tests made on men and women in which a strong internal drive is characteristic.

Dr. Frederick Lemere of Seattle, and formerly of the Eastern State Hospital, Medical Lake, Washington, has noted a certain distinct type of brain waves, obtained from patients suffering from certain forms of insanity, and it looks very hopeful that in the near future, through a study of charts obtained from many patients, we shall develop a system whereby detection of these mental deficiency cases can be found in their incipient stages. Further than this, every diagnosis and classification of the various cases of mental deficiency can be indexed.

In the next issue, apparatus for experimenting with brain wave records will be detailed.

Candid Photography

(*Continued from page* 51)

much more rapid to stop the motion of the legs or arms; but in the third case, a comparatively slow exposure can be made if we study the cycle and make the exposure at the instant the motion stops before reversing. Don't forget that when any motion is reversed, there is an instant when there is no motion whatsoever.

By workng out a half dozen hypothetical examples, one may get a clearer idea of shooting speed than by burning up a hundred rolls of film. It is easy enough to tell the amateur to give an ultra-rapid exposure when the object is moving directly across the field of view and that at 45 degrees one-half that exposure will stop motion—but it isn't true.

Assuming that the angle of the lens is sixty degrees, just what happens when the direction of approach is forty-five degrees? From the time the object enters the field until it reaches the center position (the favorite spot for the exposure) the average speed is one-third the linear speed, *but* at the instant the object is in the center of the field, its speed is about two-thirds its linear speed and after it passes the center, its camera speed is actually greater than its linear speed.

Let's see how this works out.

In Figure One we have the camera position at A. The left field limit is B and the right field limit is C. The camera will photograph everything included between these lines.

If a racing car is going broadside across the field, it will travel from B to C, or from D to F, or from G to K. In all cases we use the actual speed of the car for the basic computation.

Of course, we want the car to be sharply focussed, so we focus upon the point where it crosses the center of the field. This may be H or E or X; as the diagram is not in any definite scale, any of these distances may be of any value.

Assume that the ground speed of the car is sixty miles an hour. Then we have:

60 M. P. H.	1 M. P. Minute
1 M. P. M.	5,280 Ft. P. M.
5,280 F. P. M.	88 F. P. Second
88 F. P. S.	1,056 Inches P. S.
1,056 In. P. S.	1.056 In. per 0.001 Sec.

So the car is moving, roughly, 1-1/20 inches in a thousandth of a second. The next thing we have to determine is the distance the *image* of the car moves upon the film for each inch of real motion of the car. We will assume that we are one hundred feet from the car, so the field will be roughly 115½ feet wide. We also assume we are using a 2¼x3¼ camera held horizontally so that our field is 3¼ inches wide. Then the ratio is 1,386 to 3¼, because 115½ feet equals 1,386 inches. The ratio is then 1 to 426.46153 plus. We will approximate it at 1 to 425.

If the car moves 1,056 inches per second, the image will move approximately 2.5 inches in the same time. Now we have to determine the greatest permissible amount of movement of image we can have without spoiling the picture. For contact prints of a rapidly moving object we can tolerate 1/50th inch, but for enlargements we must have less than 1/250th inch movement.

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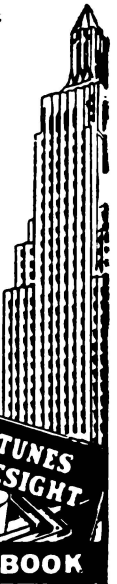

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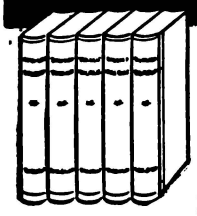

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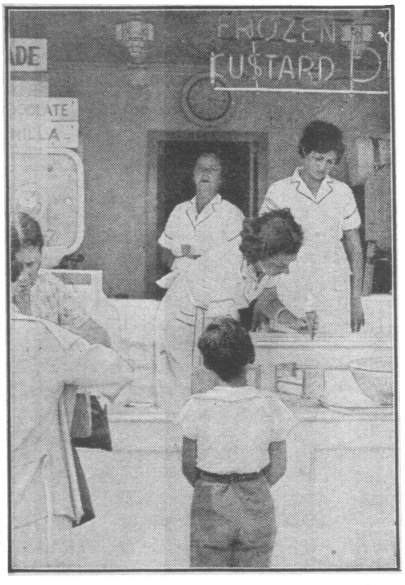
The image is moving at the rate of 2.5 inches a second or 0.025 inch in 1/100th second. As we can tolerate 0.02 inch motion for a contact print, we can see that 1/100th sec. will



Motion close to the camera will often appear blurred, but the observant photographer can await an opportune moment for snapping the scene when things are still.

give us a tolerable result while 1/150 or 1/200th sec. will lie well within the limit. But if we want to enlarge five diameters we have a limit of motion of 0.004 inch. In 1/1000th sec. the image moves 0.002, so this demands an exposure of 1/500th second.

But suppose we have a camera which does not have such a high shutter speed. Then we swing the camera until the path of the car approaches us at an angle of 45 degrees. Then if we make the exposure *before the car reaches the center of the field,* we can give an exposure three times as long, or 1/166th second. At this angle 1/100th will, in practice, give a very good result. And with a box camera, by shooting head on, say at an angle of less than 30 degrees, at a distance of one hundred feet, even the "snap" or about 1/25th sec. will give a film which will stand two or three diameters enlargement.

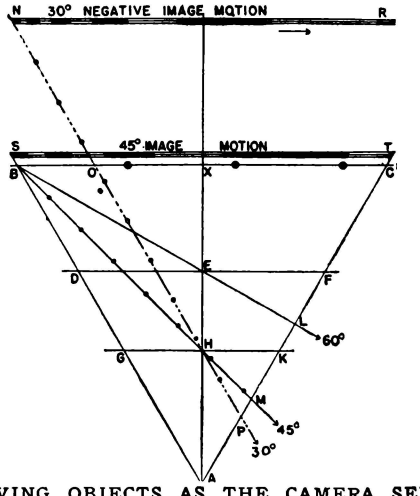
At two hundred feet the exposures are halved, that is 1/50th instead of 1/100th sec., and so on.

So, by selecting the angle and getting far enough away, it is possible to get sharp pictures of high speed objects at very slow exposures.

A practical safe rule for running animals and figures is to give an exposure one-third that necessary for the figure itself.

In all of these calculations it is assumed that the camera is held still. However, imagine a theoretical situation in which the object has a uniform forward motion. Imagine some mechanism which would swing the camera through the same angular distance at the same speed. Then any exposure could be given because the image would not move upon the film. Of

course, the background would be blurred, but the object would be sharp. This does not exist in our assumed case because the wheels are turning, the driver is moving and the car is jolting and bumping in a vertical direction. However, with a lot of practice, we can approximate the solution and by swinging the camera to follow the object, get a good shot at 1/100th or even 1/50th sec. when a stationary camera would make a blurred image at 1/1000th sec.! In news shots, notice many pic-



MOVING OBJECTS AS THE CAMERA SEES THEM

In this diagram we have the camera at A. AB and AC represent the limits of the lens' field. BL is the path of an object entering the field at B and leaving it at L, crossing the center of the field at an angle of 60 degrees. BM is the path of a second object, entering at B and leaving at M, crossing the center at 45 degrees.

The broken line NOP represents the path of an object which is in the field from an infinite distance, paralleling the left field limit and crossing the center of the field at an angle of 30 degrees.

The scale line ST shows the travel of the image across the negative for equal intervals of time, during its travel clear across the negative. The scale line NR shows the image motion for equal intervals of time of the object travelling at 30 degrees, *after it comes within 400 feet of the camera.* Because its path parallels the field limit, this object would be in the field even at an infinite distance, so we have to set a limit.

The image motion scales show why it is necessary to make the exposure before the object reaches the center of the field, because after this point the image travels faster than if the object were moving straight across the field! The small circles on the paths of travel indicate equal intervals, while the double circles on BC indicate the image motion of an object moving directly across the field of the lens. Comparison shows the angular image speed to be actually greater after the center line has been crossed.

tures of races are quite good, but the background is blurred. Such shots have been made with a swinging camera. Try it. You can develop uncanny skill in this manner.

Finally, in making the cyclical shot, don't be in a hurry. The dead spot of the motion is so short that if you wait for it your nerve-muscle reactions will be so slow that you will miss it. This also applies to straight shots of moving objects. Study the motion and identify the cycles, then *just before* the dead spot, press the release and make the exposure exactly coincide with the dead spot. This is the way stage shots are made; often shots of dancers,

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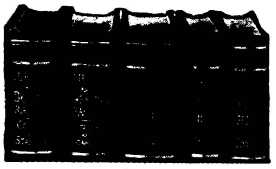

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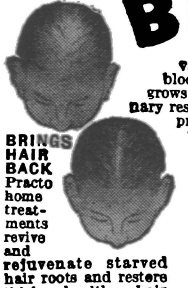

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Practice, practice and then try it some more. You can't shoot speed the first time you try, but if you will train your eyes, brain and muscles, you can develop the ability to shoot speed with uncanny precision. The illustration of the speed boat shown here was made at 1/1000th sec., the boat moving about 40 M.P.H. directly broadside at a distance of 30 feet from the camera. At that distance the rate of image travel was roughly four inches a second with the camera used. This is an image movement of 4/1000ths inch during the exposure. This in turn would mean a blur of 4/100ths or 1/25th inch on a ten diameter enlargement. The fact was that an eighty diameter enlargement was made with a blur of less than 1/25th inch, hence the equivalent exposure was equivalent to that made by a motionless camera at about 1/5000th second. The secret was that the camera was made to swing in approximate synchronism with the boat. Notice the slight blur of the trees, even though they were about a hundred yards away.

News cameramen use this trick every day, and so can you, and even if your camera is limited to 1/25th second "snap" exposure, as most box cameras are, you can still make good shots at the races if you select the distance and angle properly!

Science Advances—in the Movies!

(*Continued from page* 43)

publication knows that in the former case, sparks, flashes and rolling gas clouds tell the scientist nothing, whereas the spectroscopic analysis would unfold the whole story, and be a true representation of what actually takes place in a laboratory. However, on rare occasions, a director insists on the "real thing" and, as a result, produces a much more spectacular scene or sequence than is possible with costly non-scientific set-ups.

A grand job was done in the motion picture, "Slim," which depicts the hazards of the lineman's profession. For this, steel structures were erected and power cables were suspended from insulators in true style. Even the interior shots of the transformer stations furnish realism. The director of this feature deserves full credit for attempting scientific accuracy.

Arranging a group of mirrors in a tea shop in London, England, Herbert Parsons, a former newsreel editor, devised a system for producing million-dollar effects at a fraction of their apparent cost. By means of a handful of

players, a small scene can achieve the illusion of a mighty set with its vast chorus. Although no information as to the method used is available, we let our readers in on the secret of how similar results can be obtained. With this arrangement the amateur camera enthusiast can get some truly amazing effects: Merely set up two mirrors, practically parallel and facing each other. Set the object to be photographed between these mirrors and shoot the picture from one side. It will be observed that innumerable reflections are produced, and that, by slightly varying the angles of one of the mirrors, the reflections can be made to extend in a line running to the right, left, up or down.

Motorized Snow Shovel

(*Continued from page* 63)

The front and side views, Figs. 1 and 2, give suggested dimensions, which may be changed slightly, if desired. However, it would not be wise to make the plow very much larger, as it would become unwieldy and would require a more powerful motor. A motor of ¼ h.p. should be adequate for a plow of the size shown.

The fan housing is made of fairly heavy sheet iron, preferably galvanized. First cut out the front and back pieces. The back is a circle 24″ in diameter, having, at one side, a projection which forms the back of the flue, or outlet. The front is similar, but is cut off 1″ below the center of the circle. A piece of

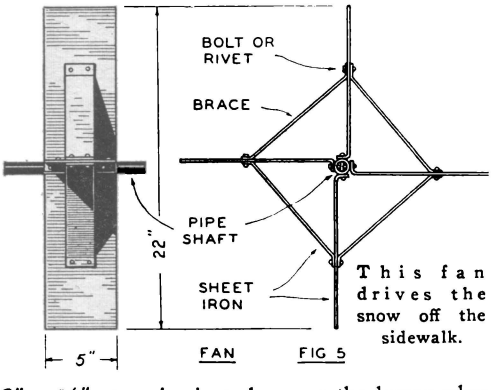

FIG 5

This fan drives the snow off the sidewalk.

2″ x ⅛″ strap is riveted across the lower edge to strengthen it, and to support a bearing for the end of the fan shaft.

Next make the side wall of the housing. This is a strip 8″ wide (6″ for the face and 1″ on each side for the tabs). It forms the outside and inside pieces of the flue as well as the wall of the fan housing. Note that the flue referred to above is only the short projecting outlet shown in Fig. 3. The long reversible flue, Figs. 1 and 2, is made separately.

Next, cut out the snow scoop. Fig. 4 shows this piece developed, or as it appears flattened out. Along the bottom edge, which slides along the sidewall, is riveted a piece of strap iron ⅛″ x 1″ x 24″. This keeps the edge straight and prevents it from being worn away. The fan is built as shown in Fig. 5. It is made of sheet iron 1/16″ thick, riveted to

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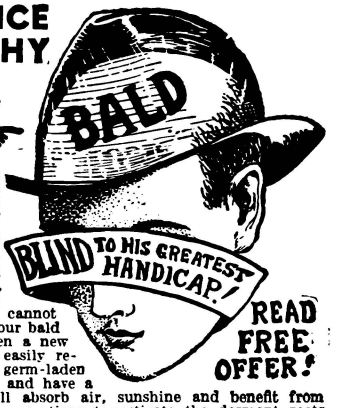

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a pipe shaft and braced as shown. After cutting out the ring (Fig. 2), which is really a half-ring mounted above the snow scoop, you are ready to assemble the fan and housing.

You will notice that the various parts are shown fastened together with bolts and rivets. If you are fairly expert with a soldering iron, a smoother and neater job is possible, but, due to the strains and vibrations which are unavoidable, the average home soldering job would soon come apart; hence the bolts, which give a very strong joint. Note in Fig. 3 how the front piece is bolted between the tabs of the sidewall and those on the snow scoop bearing. It is not necessary to use a bolt at every tab. A bolt every three inches is sufficient. Fasten on the rear piece first. Then insert the fan shaft through the hole in this piece and bolt on the front. The bearing may be a ball-bearing or a piece of heavy brass tubing. In order to shoot the snow to right or left, as desired, a reversible flue (Figs. 1 and 2) is made of sheet metal. Avoid sharp angles, which will cause the snow to clog up the flue. The best form would be a gradual curve, with no angles at all. This reversible flue is held to the fan housing with thumb screws.

The sled and motor mounting are left to the ingenuity of the builder. The photo shows a sled made of angle iron, which is the most satisfactory type. However, a wooden sled, as in Fig. 2, will do if it is strongly made. The handle is made of pipe. Note the braces holding the fan housing rigid.

The method of using the rotary snow plow is obvious. The only precaution to be taken is not to push it forward too rapidly, especially in heavy, wet snow, as this will cause the fan to become choked up, stalling the motor, and possibly bending the blades. Anyone owning one of these plows, especially a gasoline operated model, with its wider range of action, should be able to make quite a nice bit of money cleaning his neighbors' walks.

Cardboard Models

(*Continued from page* 54)

tween the cylinders. Allow the assembly to dry and add the throttles (made of No. 18 copper wire) and the cylindrical bit of Balsa that holds the throttles. Study the plans here for a more complete understanding of the arrangement.

Mount the platform upon the boiler and add the supports. Be sure that the platform is set on the boiler correctly. It must be absolutely level, and the two throttle levers should come against the curved rods that lead down to the axle.

Before you place the bamboo connecting rod in position, make sure that the No. 18 wire link, connected to the driving rod leading to the wheel, is in place and that it moves up and down freely. One end of the connecting rod should go through the hole in the cylinder platform; the other end should be cemented firmly to a cardboard brace, placed between the platform struts. This brace is about 1/16" wide. Repeat the process on the other side.

Glue the fire-grate tube in place, and the cardboard piece marked "F" beneath the

boiler. Carve the two axle carriers and the stack lead-in from hard Balsa (Fig. 6). Sandpaper smooth and mount the axle braces on the bottom of the boiler. If these are the least bit out of line, the wheels will not roll properly, so be careful here.

Cut out the stack pattern (Fig. 5) and roll it around a pencil to give it a curved shape. Then spread a little glue along the lower edge of the pattern and pin it around the Balsa lead-in (Fig. 6). Add more glue along the seam and hold the edges together with pins until dry. Then mount it alongside the firegrate tube, as shown on the plan.

The steam pipe that leads from the stack to just behind the throttles is a length of "lollypop" dowel. It is cut off to the proper length and glued in place. Do the same with the two small pipes that go from this lead-in to the boiler. Two short lengths of thin wire, or thread, representing braces, are led from the stack to the boiler. Figs. 7 and 8 show the end assemblies.

Make four No. 18 wire braces "U" shaped to hold the axles. Consult the plan here; it will give you the correct size and placement. Add a little glue on the ends before you push them into the wood and make sure that you leave enough of the wire so that there will be sufficient room for the axles to turn around freely.

There are several different ways of making the wheels. They may be cast of lead in a plaster of Paris mould, purchased, or made of cardboard. Since our model is of cardboard, here are the directions for making simple, accurate wheels out of a cardboard tube.

First, you must have a tube 1⅛" in diameter and about 4" long (Fig. 9). The tube should not be any thicker than ⅛". Varnish the tube well, both inside and out, with a soft brush. When dry, mark off four bands about 3/16" wide, and make twelve evenly spaced holes in each band. It is a good idea to start them with a pin and then gradually widen the holes with the point of a compass. Cut off each band carefully with a good razor blade, so that you have four separate rings, each with twelve holes.

Next make the Balsa hubs (Fig. 9) about ⅜" in diameter, and for each hub make two cardboard discs the same diameter. These are glued to both front and rear of the Balsa hub to give it sufficient strength. Run a short length of No. 18 wire through the hub to take the driving rods. Assuming that all four hubs have been made and their cardboard facings have been glued on, carve out twelve spokes for each wheel (a total of 48), and sandpaper them smooth. Match sticks or round toothpicks may be used. These are set in the hub in the manner shown on the plan. Place the rim over the spokes in such a way that the spokes fit into the holes in the rim (Fig. 10). Put a drop of glue on the tip of each spoke to make sure that it does not loosen. Cut out the cardboard flange and glue it to the rim, resting a light weight on the assembly so that it will not twist.

Glue one wheel to each axle—a length of lolly-pop dowel, 1¾" long—and slide it

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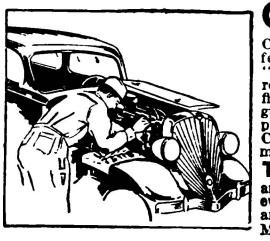

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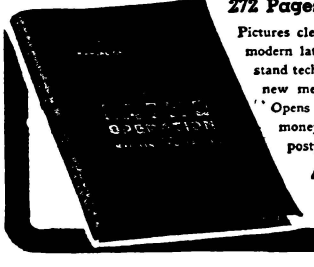

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through the "U" shaped wire in the axle carrier, then add the other wheel and allow the assembly to dry. Put the main driving rods (Fig. 11) on first, and make sure that they work smoothly. Next add the rod that runs from the piston to the wheel. Place a drop of glue on the end of the wire holding the rods so they cannot slip off.

Mouldings are made of 1/16" cardboard strips glued in place on the boiler and around the stack.

A good mounting for the model is made of a piece of cigar-box wood with an extra-heavy piece of black sandpaper glued to it to represent ballast. Two ⅛" x ¼" strips of wood with silver foil cemented on top form the rails. They are spaced 1¾" apart over 3/16" x ¼" ties. The correct coloring for the model is black, yellow and green.

House Pests

(*Continued from page* 66)

after which this group is named, is the common larder beetle, *Dermestes lardarius*. The upper surface is densely covered with short black hairs. The wing covers are provided with a broad longitudinal stripe, yellowish brown in color and ornamented with black dots.

During the summer months this beetle occasionally may be seen upon flowering plants. It is more generally found in the pantry upon smoked meats, cheeses and on dried skins. Furs, feathers and hairs are also attacked in the home. In addition, this pest is frequently present in dove cotes. In fact, the larder beetle will usually make its appearance where animal substances are located upon which it feeds.

Within the home of man, where this creature is protected from all adverse outside conditions, and where a plentiful supply of food is always available, four to five generations are regularly produced each year. The interval between generations is about 50 days.

The damage that can be caused by the larder beetle and its close relations (which have been inadvertently carried from one continent to another) is considerable. In South America, for instance, where the export of dried skins has become a great industry, the larder beetle has become a pest of major proportions. They gnaw muscles and the inner side of the hides.

When these creatures are disturbed in the routine of their daily lives, they play "possum." Then they look like a dead insect; feelers and legs are drawn up tight against the body. This is a condition of rigidity—a cataleptic state not assumed for the purpose of deception. It is real. When the creature reawakens, the joints of the legs tremble. This is followed by the jerking of the maxillae and the feelers. Gradually, as rigidity disappears, the normal condition and activity is restored.

The larvae of the larder beetle are slender and are provided with a peculiar covering of long hairs. The coloring of the upper surface is brownish, the lower under surface is of a dirty white. Two slightly bent thorns are provided on the upper side of the last abdominal segment. The legs are short. The food of the larva is similar to that of the adult. When the

time of pupation arrives, the skin on the back bursts open and this discarded exoskeleton is then used as a protective coat for the pupa.

Beetles and larvae, when found, are easily destroyed by crushing. Fumigation may be used. Carbon bisulphide (extremely dangerous as it is very inflammable) may be used to the extent of 1-1/3 ounces for each 3 cubic feet of space to be fumigated. The place must be carefully sealed and all foods must be removed. After permitting the gas to act for 10 hours, the place must be thoroughly aired and ventilated.

Since cheese attracts them, it may be used as a trap. Place a few pieces here and there and collect and destroy all beetles thus lured to the spot. Finally, ground or grated cheese can also be mixed with arsenic. Larvae and adults feeding on this poison will be killed.

Wherever the larder beetles have been permitted to multiply, thorough fumigation becomes necessary. This should not be attempted without the aid of an expert fumigator or insect exterminator. They have the equipment and facilities and know how to go about it. One of the best methods of assuring the destruction of the larder insect is by means of hydrocyanic acid gas. This is a very dangerous chemical, as even small quantities of this gas are fatal.

Since the larder beetle prefers to be around and near the pantry, where all sorts of foodstuffs are stored, great care must be taken to see that all foods, including smoked meats, are thoroughly wrapped before they are put away. In this way the larder beetle is deprived of its source of food.

Front Tire Blow-Outs Are Not Hazardous

(*Continued from page* 45)

trifugal force, keeps the tire partially inflated.

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driven any considerable distance, the heat tears it to pieces. On one test the machine was driven for eight miles at from fifty to sixty m.p.h. and the tire was nothing but shreds, yet it remained firmly fastened to the wheel. A combination of centrifugal force and the beads keep the rim of the wheel from striking the pavement and injuring the wheel.

Gopher Burrows for Trucks

(*Continued from page 37*)

straightways give easy trucking climbs for heavily-laden traffic. The trucking area is a huge hall, 190 feet long by 185 feet wide; here trucks will be backed against receiving platforms for deliveries to the British Empire Building, the Maison Francaise, the 70-story RCA building, the Palazzo d'Italia, the International Building and the International Building East; additional buildings will also be accommodated.

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"Kanonen Statt Butter!"

(*Continued from page 33*)

cubes is prepared and the chopped meat is boiled in the gravy. When garnished with slices of lemon and potatoes, the hash is deemed most palatable.

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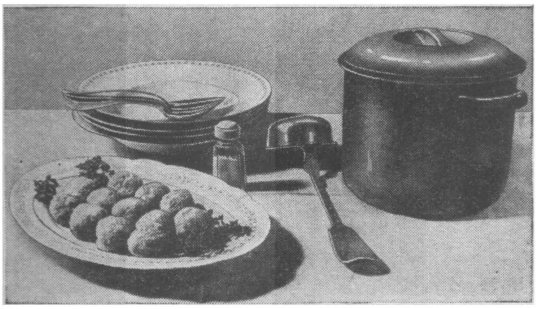

The active ingredient in these meat balls is pigskin, used first to flavor yesterday's pea soup, then grated and disguised.

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Historic Inventions

(*Continued from page 71*)

Building to the Capitol, some being exposed to water. In 1916, for some reason, they were sent to the District Jail for storage, but when conditions became overcrowded there, they were stored in a private warehouse in an alley back of G Street, between Sixth and Seventh.

It was here that the committee found the models and made the selection of 20,000 items for the National Museum. When the selections had been completed, the affair was at an end, for the Act only authorized the dispersal of the whole collection of models and made no provision for cataloguing, for repair and reconstruction of damaged models (there were many of these) or for their exhibition. They simply were stored again.

Then came the Works Program. The Smithsonian Institution sponsored a project to check, catalogue, and repair those models that were of historical interest. First under the Civil Works Administration, then under the Federal Emergency Relief Administration, and now under the Works Progress Administration, this business of cataloguing, repairing, reconstructing and exhibiting has gone forward until now the National Museum is able to put on display many of the important basic patent models of the 1836-1890 period, together with their developments.

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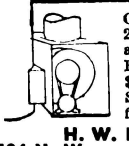

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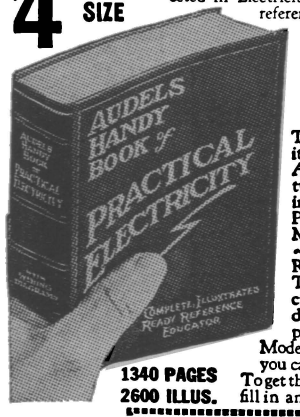

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made, according to government propaganda, from a pound of cow's udder, onion, two rolls, some vegetable fat, with salt and pepper added to taste.

Meat balls are another "delicacy," but should be made this way: Boiled pigskin (which was used to flavor yesterday's lentil or pea soup) is put through a meat grinder, mixed with grated onions and hard rolls to form a tough dough. These meat balls are boiled either in salted water or a bouillon cube soup and "are very tasty," say the Nazi food authorities. For the epicure the following is recommended: Cabbage leaves are boiled. Oats are allowed to soften for one hour in milk, then worked into a dough with salt, pepper, grated onion and one cube of soup. Enough dry bread is added to make an elastic mixture. A tablespoonful of this product is put between two cabbage leaves, which are tied together by a thread and then fried in fat. Water is added and the dish is permitted to simmer until it is done. If you are very hungry you can have some boiled potatoes with this.

Bread is, of course, a very important requirement with every meal. The recommended bread, in Germany, is to be made by boiling until soft two pounds of pumpkin; to this two pounds of flour, yeast and a pinch of salt is added, and the whole is permitted to "work" for an hour. The product is then baked for another hour and the substitute is reported to be better than white bread for either sick or healthy.

Perhaps these new dishes will make Germany self-sustaining. Unquestionably, if the populace takes to them as greedily as the propaganda department hopes it will, much raw material will be released for the making of food concentrates—and weapons.

What to Invent

(*Continued from page* 49)

lights on a pre-arranged time schedule. A toy of this kind, made to sell for a dollar, would win many friends in the retail field.

The toy steam engine would be a lot more popular than it is at the present time if it did not involve scalding water and the possibility of explosion. Why not make some sort of a little "steam" engine that could be operated by compressed air and would make noises like a real steam engine? The trick requires a new type of small but efficient air pump which could be placed on the base of the engine and with which a high pressure could be generated in a few strokes. A safe and sane steam engine would be a fast selling number in the toy shops.

A few issues ago, we talked about a shower bath with automatic temperature control which would not permit water beyond a certain preset temperature to pass. This was admittedly a tough nut to crack, but there is still a need for a temperature indicator on a shower bath; a little dial on which the bather may see the degrees of heat before he steps under the spray. Most people like their baths at a certain temperature; a thermometer takes care of this requirement in the bath-tub. The

same convenience, extended to showers, would be worthy.

Many improvements have been made in vacuum cleaners during the past few years, but much still remains to be done. At best, the large bag in which the dirt collects is a messy, unsatisfactory affair. Would it not be more pleasant if the housekeeper could attach a small and inexpensive paper bag to a cleaner before use and throw it away after the cleaning had been done? Such bags could be very small and should cost only a small fraction of a cent each. Here is something to think about. The inventor should devise a simple, easy way to attach the bags so that the point of contact with the cleaner will not leak dust. Properly exploited, there is $50,000 waiting for the inventor of an ideal product.

For many years men have wanted better belts; more comfortable and longer-wearing products which would automatically adjust themselves to the waistline, especially after meals. The rubber fabric belt made its appearance but, for some reason or other, it never made good. For one thing, rubber will not hold its elasticity over long periods of time; it becomes hard and deteriorates chemically. Is there not another answer to this problem? There certainly should be! What about tiny steel springs coiled up in a belt? We don't mean springs running all around a man; a small spring link in a belt would do. Such springs would never wear out and, while the belt might cost a little more, men would be willing to pay the price.

Water pipes are held to the rafters and walls of houses by means of ordinary staples. This intimate contact results in a great deal of amplified noise. When water is passing through the pipes, the whole house acts as a sounding board. It is obvious that sound conditioning should begin with the plumbing. Can our inventor-readers think of some kind of a cushion to be applied between the pipe and the rafter and really insulate the pipes? Such an article need not cost more than a cent or two each. Insulating the base of the toilet from the bathroom floor would also help to reduce noise when the toilet is flushed. Of course, an entirely different gadget would be required for this.

In this country every year millions of women make their own jelly. One of the most unpleasant tasks in jelly making is skimming off the scum that forms while the fruit is cooking. This scum is viscid and sticky and it must be removed a number of times during preparation. Can't our inventors help these women out in some way by giving them a little skimming device to make the work easier and faster? These jelly makers do not want to stand over the hot stove any longer than necessary. If the answer to the jelly-maker's prayer could be sold for 25 cents, a tidy little fortune could be rolled up in a year's time.

Mothers with babies have many little problems that could be solved by inventors. Take the case of the small child who is just beginning to eat solid food in his high-chair. How many times does he take the dish, while mother's back is turned, and crash it to the floor? Mother not only has one less dish in the house, but she has a nice mess to wipe up.

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State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and County aforesaid, personally appeared N. L. Pines, who, having been duly sworn according to law, deposes and says that he is the Publisher of Mechanics and Handicraft, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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Sworn to and subscribed before me this 30th day of September, 1937. Robert A. Pape, Notary Public, commission expires March 30, 1938.

How about a high-chair with a simple dish-locking device on it; something made of wire that could be produced cheaply and into which the dish could be slipped without much trouble? Would *that* sell? Ask the mother who does not own one!

Handicraft in Metal

(*Continued from page* 62)

drilled through the center to take the ⅛" pipe The three feet are formed by placing the tray on a block of lead and driving the material down with a ½" round-end punch. These should be driven down far enough so that an ordinary drop cord will fit under the tray without interference.

A length of threaded ⅛" pipe is run up through the center of the tray, and a nut is screwed onto the bottom end. The bottle is set down over the pipe, and a light socket is tightened down on the upper end of the pipe allowing the neck of the socket to enter the neck of the bottle. The wiring is carried up through the pipe, allowing the cord to run out under the tray.

The shade is of No. 22 gauge sheet copper, hammered on one side, rolled into shape, and riveted together. The four straps are cut, hammered, lined, and riveted on as shown. One of the ten-cent-store type of adjustable wire clamp attachments is set up in the apex of the shade, and clamps over a round bulb to hold the shade in place.

The outside of the shade is finished in brown with the liver-of-sulphur solution, and the base tray is polished copper. An ordinary whiskey glass is set in one side of the tray to hold cigarettes.

The next lamp, shown in Fig. 5, may look difficult; however it is very simple, requiring possibly a little more time, depending largely upon the skill of the workman. A 7¾" length of copper tubing 2⅜" in diameter, and with a wall about 1/16" thick is thoroughly annealed. Hold one end on the anvil, or some smooth steel block, and with the hammer, drive the metal in all around at one end, and taper gradually toward the other end as is illustrated in the photographs. After going over the piece once, anneal again, and repeat; continue this operation until the diameter near the base is about 1½", then with the ball peen hammer, open the base, and spread out to a diameter of about 3½". Place the tube over a round bar of iron, or a piece of iron pipe, and expand the top of the tube slightly by hammering it directly on the iron bar. Lay out and cut in the design with the blunt cold chisel while still over the iron bar; then, with the ball end of the hammer roll the top out irregularly as shown.

Cut out two disks of No. 18 gauge soft sheet copper, and shape them, one for the top and one for the bottom, over hard wood blocks, as was done in forming the caps for the aluminum lamp. Drill 7/16" holes in the center of each; the bottom one is driven in and soldered in place. The top one, if driven tight, will not need soldering.

Run a ⅛" threaded pipe up through the two holes, and tighten with fixture nuts on each

end. Drill a 7/16" hole near the base of the lamp, as shown, and insert a fiber bushing. Run the wires in through the bushing, on up through the tubing, and connect with a socket, which should be screwed down tight on the upper end of the tubing. The lamp should be finished with the dark finish. That portion above the lines should be left black; from the lines down it should be burnished and polished.

Select a shade that goes well with the lamp, preferably parchment.

This same procedure may be carried out in the production of hammered copper bud vases.

Any size tubing, with a fairly heavy wall, may be used, and shaped in the same way. Decorate as desired, and a bottom can be soldered on.

Popular Magic

(*Continued from page* 65)

in the hands of a spectator, is invaluable. A case, made of a few sheets of metal, or even cardboard, slightly larger than an ordinary playing card, has a 1" hole clear through the center. The playing card is passed between the two layers of the case, in envelope fashion. The spectators are permitted to see the card through the opening in the center up to the very moment of its disappearance. In the act of placing the playing card inside the case, it is not inserted into the slot provided for it, but, in reality, is pushed in back of the case. When the case is held in front of a spectator, and while shifting it from one hand to the other, the card is palmed and retained. By sliding a pin upward, a 1¼" section of card, cut from a duplicate playing card, is brought into view. This small section slides freely up and down in a channel, and gives the impression that the card is visible through the opening in the case.

The pin, of course, is affixed to the small section of the card, and is worked from the back, hence the card case is never given to the spectator, but held just in front of his eyes. By pushing the finger against the pin at any desired moment, the pip of the card, showing through the opening, is made to vanish, or to appear. A case could be made without the pin control. Here the pip is glued to a small piece of metal, which slides freely in the channel. Tilting the box will then cause the metal piece to slide and make the card appear or vanish at will. The latter construction allows for examination of the front and back; however, an adroit magician can cover the pin with his finger and, in the act of turning the case over for examination of the back, the "change" is made.

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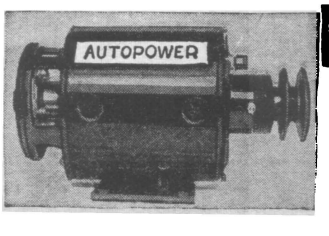

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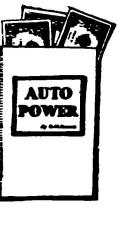

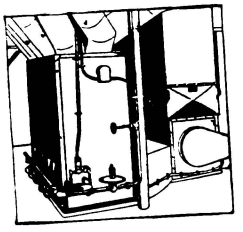

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New 6-Volt TRINDL Electric ARC WELDER

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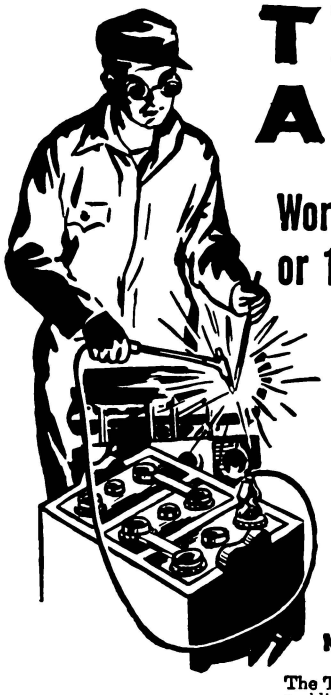

Works on Storage Battery or 110 Volt Light Circuit

A REAL WELDER

Men, here is the hottest specialty item that has come along in years. A real honest to goodness electric arc welder that does a man size job. Built sturdily of the finest materials. Requires no mechanical knowledge—any one can use it. Every demonstration should make a sale. This new Trindl Electric Arc Welder is made possible by the invention of a low voltage carbon which gets white hot from the current of an ordinary 6 volt storage battery such as in your automobile. It only uses about 20 to 25 amperes of current which is about the same current drain as 4 headlight bulbs, yet develops about 7000 degrees of heat.

RETAILS FOR **3.75** EA.

MELTS IRON AND STEEL INSTANTLY

The Trindl Welder is simple to use. Expert welding can be done by anyone. The Trindl Arc Welder is the only battery welder that, after a rigid test, has been approved by the Automotive Test Laboratories of America. It is ideal for making permanent fender repairs—also for broken castings, radiators, cylinders, water jackets, holes in auto bodies, hog troughs, boilers, tanks, milk cans, radios, batteries, etc. Iron, Steel, Brass, Copper and Tin can be worked on for a quick and permanent repair. The repaired part will be as strong as before.

NEW 110 VOLT CONVERTER MAKES FULL SIZE PROFESSIONAL UNIT

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USERS SWEAR BY IT—The price is so low that now anyone can afford to have a real welding outfit. Think of the profit you can make introducing this Trindl Welder and Converter—a simple five minute demonstration should make a sale to every interested prospect, especially when they hear the amazingly low price. Garages, radio and battery men, tinners, sheet metal workers, janitors, farmers and home-owners all need the Trindl Welder and Converter.

ACT NOW! There are big profits and a steady business waiting for you taking care of your territory for us. Don't let someone else get in before you—Send coupon Today.

FACTS

Here are just a few excerpts from the many letters of praise we have received from Trindl Electric Arc boosters.

"Please find enclosed for 12 welders by return mail for I am about sold out now. They are selling fine."—W. C. Anderson, Nebr.

"Received my Trindl Arc Welder and am both pleased and surprised."—Louis F. Glier, Ohio.

"Results are very gratifying with your welder. I am enclosing an order for 12 more Electric Arc Welders." — Nelson O. Lyster, Florida.

"I received my welder, and it is a regular repair shop in itself." —J. R. Harper, La.

"I sold 4 of your Trindl Electric Arc Welders in three minutes." —C. Gillies, Canada.

"I sold 9 welders in my first ten calls."—F. W. Stice, Iowa.

$10.50 a day profit for you for only selling 6 Trindl Arc Welders. No matter where you turn, you will find people who will want to buy arc welders from you. Garages, shop men, radio repair men, farmers, home-owners, mechanics, janitors, all of them need Trindl Electric Arc Welders. Be the man in your territory to clean up with Trindl.

MAIL COUPON NOW!

TRINDL PRODUCTS
2229- YN Calumet Ave.
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Yes! Rush me free particulars of how I can make big money with Trindl Electric Arc Welders and Converters. This does not obligate me in any way.

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Amazing!.. MIDWEST'S ELECTRIC TOUCH BUTTON TUNING..

only $49.95 LESS TUBES

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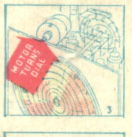

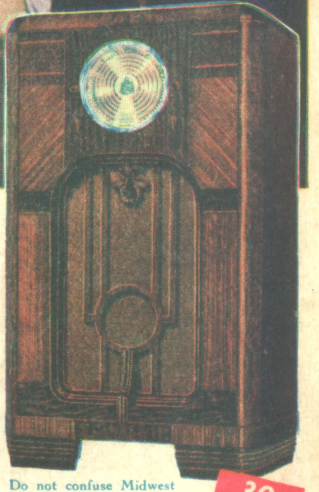

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The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. It enables you to buy at wholesale prices . . . to save up to 50% . . . to make your radio dollar go twice as far . . . and to pay as little as 50 cents a week on the Midwest Easy Pay Plan.

EVEN MORE GLORIOUS TONE

When you tune in a domestic or foreign program on this super 20-tube 6-wave band 12,000 - mile - range Motorized Midwest, you hear it with a new clarity, new depth and an intensity of feeling. Glorious, crystal-clear concert realism and brilliant foreign reception are now realities. Super power and 101 advanced features enable you to bring in weak distant foreign stations like "locals." Now delight in American, Canadian, Police, Amateur, Airplane, ship broadcasts . . . and finest Foreign programs.

30 Days FREE Trial In Your Home

Act at once on this unusual factory-to-you offer. We send any Midwest radio you desire to your home. You use it 30 days, and compare it with other radios you have owned or heard. You are triply protected with One-YearWarranty, Money-Back, and Foreign Reception Guarantees.

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